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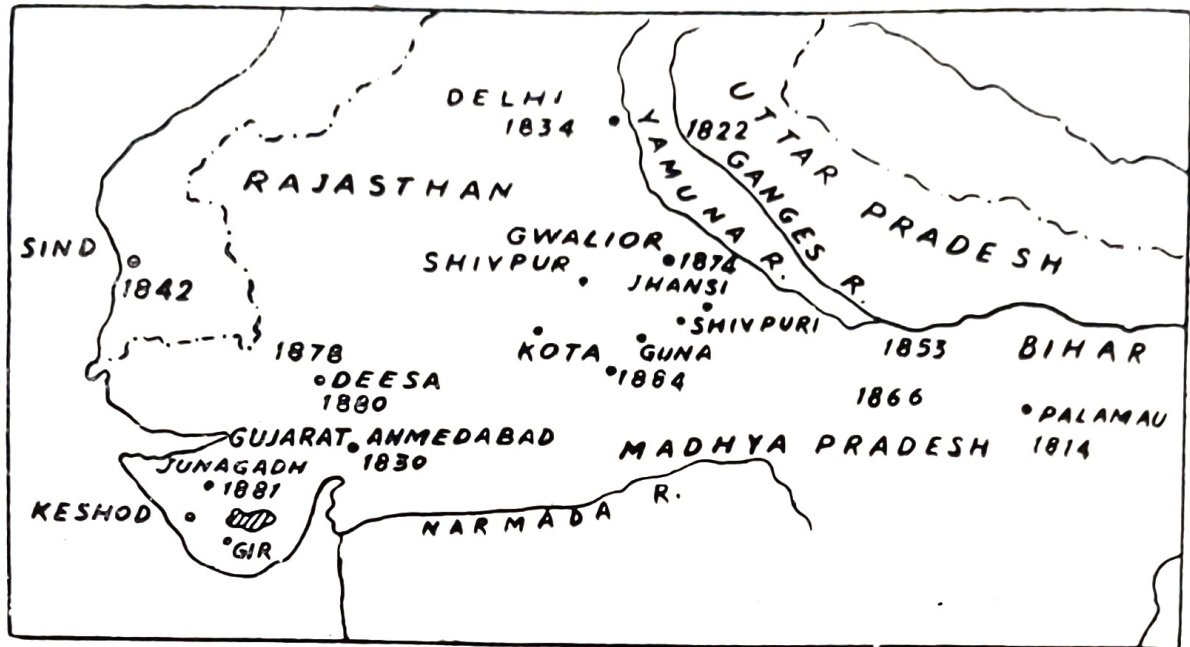
March & June, 1983

No. 3 & 4

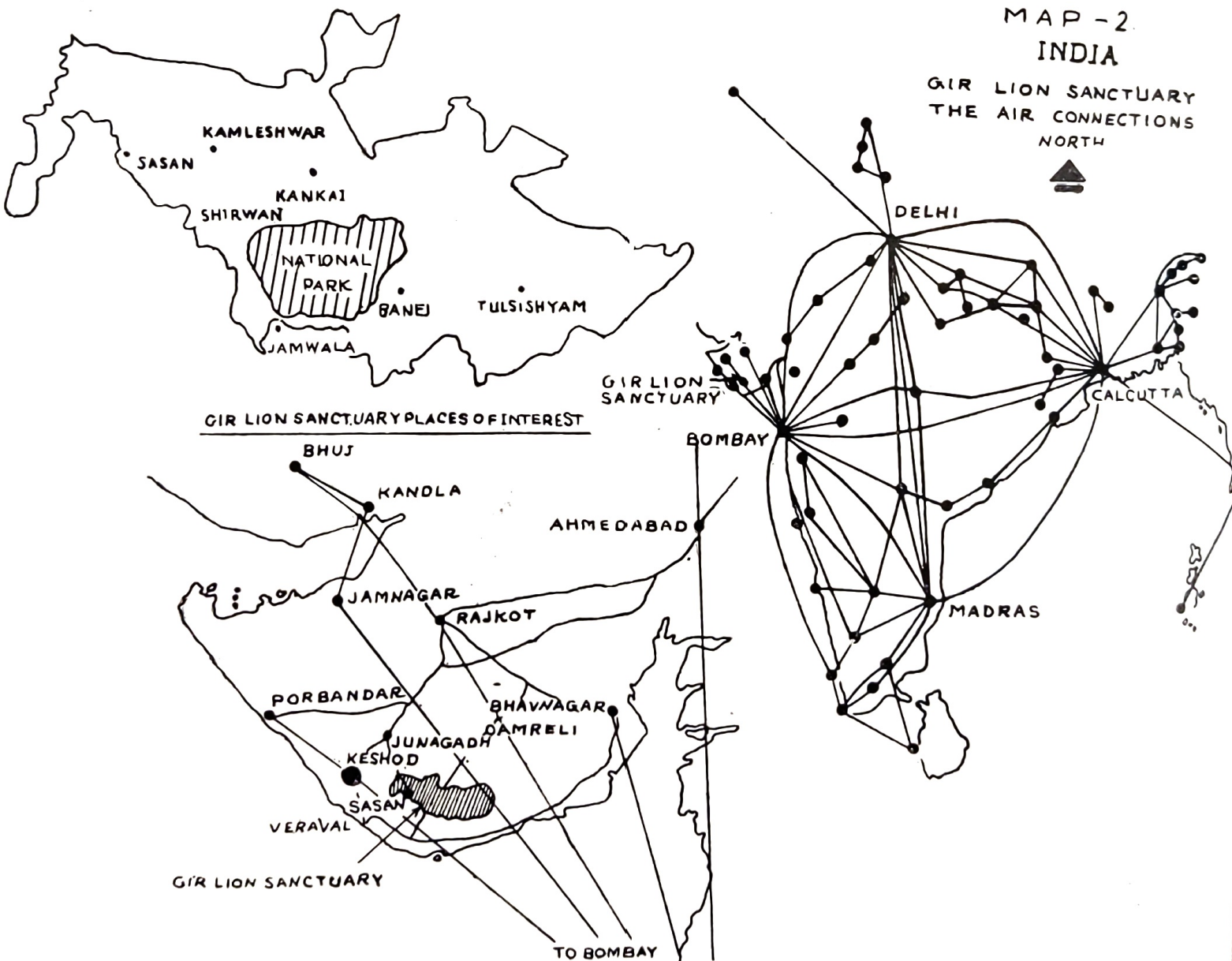
Female purple sur.-bird approaching nest (*Cinnyris asiatica*)



MAP-1
Distribution of Lions in India, 19th Century A.D.



MAP-2
INDIA



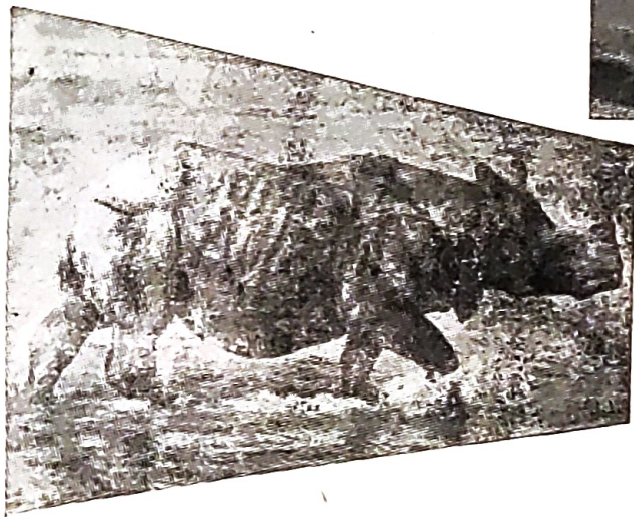
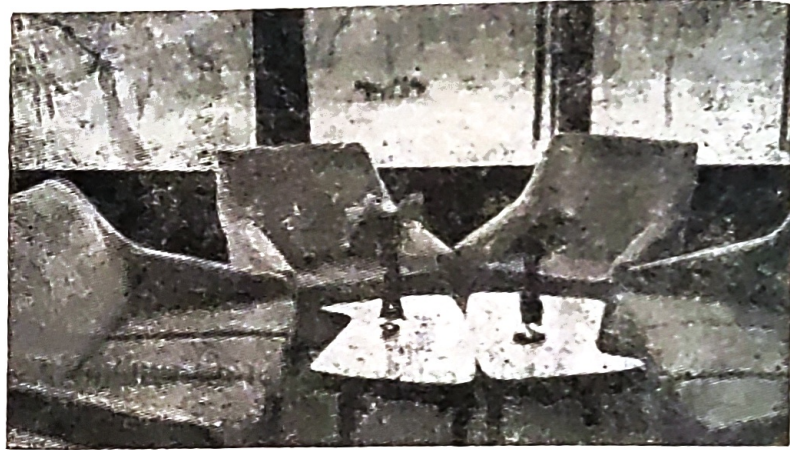
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CHEETAL

Journal of the Wildlife Preservation Society of India

Vol. XXIV

March & June, 1983

No. 3 & 4

Silver jubilee celebrations of the Wildlife Preservation Society of India continue during 1983.

The Society organised a Wildlife Painting and Poster Exhibition to celebrate World Environment Day (5th June) 1983.

The Surveyor General of India Shri G.C. Agarwal opened the exhibition and it was largely attended for five days.

During the month of June 1983 the Society invited eminent Wildlifers to address the members of the Society and guests.

Shri K.S. Sankhala, the internationally renowned Wildlife conservationist and author and a Patron of WPSI, talked to the members of the Society on the Desert National Park in Rajasthan. The talk was illustrated with a hundred coloured slides. The talk was interesting, colourful and informative and was greatly appreciated by the audience.

Another Wildlife Conservationist Shri S.P. Shahi, Chief Conservator of Forests, Bihar (Retd.) talked of Wildlife and showed many of his beautiful Wildlife slides and lamented the non enforcement of Wildlife Act, particularly outside the Government Forests. He cited a case of thousands of ducks and geese being netted and sold in one of the wetland areas in North Bihar.

The next in the series was an illustrated talk by Dr. J.B. Sale, F.A.O. specialist in Wildlife Management and Chief Technical Adviser, Wildlife Institute of India, on problems of Wildlife Management in India. "He focussed the attention of the audience on the problems with good colour slides. It was something new to the audience except to the Wildlife experts present, and even they benefited by the talk.

Dr. Salim Ali a world famous ornithologist and an Honorary Member of WPSI, gave a most interesting talk on ornithology in India and showed a Films Division colour film on his own life and work. It was followed by a question-answer session much to the delight of the audience. This was followed by a fifteen minute colour film on the Red jungle fowl, incidentally taken in the Rajaji Sanctuary by Dr. Colias of California University. The WPSI helped Dr. Colias with all local arrangements, during the filming and the research project.

The Society intends holding many more such functions during the Silver Jubilee Year 1983.

Convention on International Trade in endangered species of Wild Fauna and Flora

**Speech of Sri Samar Singh, Director Wildlife, Government of India, Chairman
Standing Committee of CITES at the Fourth Meeting of the Conference of the
Parties, Gaborone (Botswana), 19-30 April, 1983**

Your Excellency, Honourable Ministers distinguished guests, fellow delegates and participants to the Fourth Meeting of the Conference of the Parties to CITES.

1. On behalf of the Standing Committee as well as on my own behalf, it gives me great pleasure to welcome you all to this historic meeting.

We are greatly honoured by His Excellency Dr. Masire, the President of the Republic of Botswana, who has so kindly agreed to grace this opening ceremony and to address us. This is a measure of the importance His Excellency attaches to the purposes of this meeting and the serious concern which his Government feels about the need to ensure more judicious use of the rapidly dwindling living natural resources of the world. We are very happy that the Honourable Minister of Commerce and Industry and the other dignitaries of the Government of Botswana have found time to be with us this morning and I welcome them warmly on behalf of all the Parties to CITES. We are also most appreciative of the presence of Dr. Mostafa Tolba, the Executive Director of UNEP, who needs no introduction to this august gathering.

2. I refer to this meeting as historic for more than one reason. First and foremost is the fact that this meeting is being held for the first time in the continent which has at present more than one-fourth of the total number of Parties to the Convention. When we last met in New Delhi at the beginning of 1981, twenty States from Africa were Parties with the Republic of Central Africa as the last to join before the meeting commenced. However, before the meeting concluded, Rwanda and Zambia also joined and during the last two years we have welcomed to this brotherhood from this great continent the States of Liberia, Mozambique, Zimbabwe, Cameroon, Malawi and Sudan. As this present meeting concludes, the convention will enter into force with respect to Congo, thus raising the total number of Parties to 81 on 1 May 1983, out of which 28 will be from Africa. On behalf of the Standing Committee representing the interests of all the Parties, I wish to felicitate the Governments of all these States for their wisdom and sagacity in coming forward to strengthen the Convention. I look forward with great hope and expectation to their example being emulated by not only the other African States who have yet to join but also by all others who must recognise that it is only through international co-operation that they can secure the full and continuing benefit of their own natural living resources.

3. The other main reason for calling this meeting historic is that this year CITES completes a decade of its existence. Ten years ago, 36 States joined together at Washington to give birth to the convention. Now, ten years later, 81 nations of the world, covering well over three-fourths of the land area of the globe and representing such a wide variety of situations, conditions and interests, are Parties to the Convention. Of these, are present here to review what has been achieved in this first decade as well as to find ways and means to strengthen further this most widely accepted international agreement on natural resources in existence today. It was in one of the main "consumer" countries that the Convention was born. It is most appropriate that the tenth anniversary is being witnessed here in a region with the largest number of "producer" states. This is very significant because the entire philosophy of CITES is founded on the bed-rock of deep concern and co-operation between the producing countries and the consuming countries of the world.
4. It is a tribute to the great wisdom of the Governments of all the "producer" States which are Parties to the Convention, and largely represent the developing world, that recognising the urgent need for international co-operation to conserve the irreplaceable life support systems and resources of the earth, they have come forward so positively and in such large numbers as to form now more than 2/3rd of the total membership of CITES. This development is now in the nature of a worldwide movement, which needs not merely to be widely acclaimed but more importantly should secure the full understanding, support and co-operation of all those whose demand and consumption is the major cause of the worldwide depletion of natural resources, particularly of wild fauna and flora. Effective control and regulation and indeed restraint of such consumption, to preserve the genetic diversity of the world and to ensure sustainable benefits to present and future generations, is the one and only way to ensure the future survival of mankind.
5. On an occasion like this, one is tempted to look back to the past for a moment, I am reminded that it was at the United Nations Conference on Human Environment at Stockholm in 1972 that the "Wildlife Principle" was unanimously adopted by the 113 nations represented there. These were the historic words in which the principle was enunciated:

"Man has a special responsibility to safeguard and wisely manage the heritage of wildlife and its habitat which are now gravely imperilled by a combination of adverse factors. Nature conservation including wildlife must therefore receive importance in planning for economic development."

It is worthy of note that it was the leader of the Indian Delegation at this Conference, Prime Minister, Mrs. Indira Gandhi, who took the initiative in introducing this principle and in securing its unanimous adoption.

6. It was also at this UN Conference that another principle of great significance was enunciated. This recognised that all species form part of the common patrimony of humankind, and that the developed world might well assume a greater share of the costs of conserving this global heritage. Known as the "Additionality Principle", it proposed that compensation payments on an appreciable scale be made by the community of nations—mainly by those who could afford it—to the developing world, in order to offset adverse repercussions on the emerging economies from measures for conservation and environmental protection. It was not proposed that this additional assistance should be made available out of a spirit of charity. Rather, it should reflect a recognition of joint responsibility for the depleting assets of a common heritage.
7. Wild flora and fauna are at greater risk today than ever before. Numerous studies commissioned by Governments and concerned organisations indicate that if the present trends continue, by the year 2000, about 200, of all present living species of animals and plants will be extinct. Extinction on this scale is without precedent in human history and the consequences are too staggering to contemplate. In such a situation, CITES has a role of the greatest importance to perform. It is a matter of great satisfaction that it has today such a large coverage as well as such wide acceptability. Yet, so long as there remain significant gaps in its coverage and unscrupulous trading interests continue to be left : scope to operate, the effectiveness of CITES cannot but be severely limited. It is of course essential that member nations perform their duties in the manner expected of them and implementation follows both the letter and the spirit of the Convention. These and related issues are matters to which we will be addressing ourselves during the next new days and the outcome will hopefully further strengthen the purposes and effectiveness of the Convention.
8. In this context, the non-government organisations have a vital role to play. CITES is a unique arrangement which brings together a wide variety of interests for a common cause. The fact that such a large number of international and national level non-governmental organizations are represented here today is, I believe, an indication of their sense of responsibility towards ensuring the effectiveness of the Convention. May I appeal to all the NGO's represented here, and through them to the community of NGO's worldwide, to redouble their efforts for spreading the gospel of conservation in its true sense. In a world dominated by the ethics of consumerism, theirs must be the endeavour to change this to one of frugal use of natural resources, for ultimately it is in this alone that our salvation lies.
9. One of the crucial issues to which this meeting will address itself is the question of the financing and the relationship with UNEP and IUCN. We are all well aware of the direct support provided and the catalytic role played by UNEP for CITES in the past

(Contd. on Page 50)

The Unique Desert Wildlife of Gujarat*

S.K. SINHA

Conservator of Forests, Research and Working Plans Circle, Vadodara, Gujarat

Gujarat has two rare wildlife species not seen elsewhere in India. One of them, the lion is well-known and found in the Gir-Forests. The other is the Indian-Wild-Ass found in the little Rann of Kutch. This animal has also been, locally nicknamed Ghurkhar which aptly describes the animal which has the speed and strength of a horse, though in physical appearance it resembles rather the humble ass. It is one of the sturdiest animals of the world. At—times, it can run at a speed approaching 60 Kilometres per hour.

The Wild-ass Habitat :

Scientifically named *Equus hemionus khur* the Ghurkhar or the Indian wild-ass also known as the Indian onager is found only in the little great ranns of kachchh which is a saline clayey expanse of treeless wasteland. Even under scorching mid-day sun when temperatures may touch 45 degrees centigrade or more, they stand in the midst of the desert. However, they stray out occasionally in the neighbouring villages bordering the desert during cooler hours, mostly for green pastures. Though the rann is mainly a saline waste, it has some islands having good grasses and some acacia trees. These islands are most favourite haunts of the wild-ass.

To save this rare species, the Gujarat Government declared an area of about 5000 Km² comprising the little rann and adjoining wastelands forming their habitat as a wild-ass sanctuary. This sanctuary falls in the districts of Surendranagar, Mehsana, Banaskantha, Kachchh and Rajkot. The management of the sanctuary and the protection of the wild-asses is done by the State Forest Department.

Wild-ass Census :

The wild-ass habitat is very harsh for humans and renders sustained observation of the animal difficult. This explains rather a great dearth of information about this animal. All the same, looking to the rarity of the animal, some attempts have been made in the past 37 years to obtain some information. These have mostly been in the form of various population estimates. Between 1946 and 1976, five such attempts were made. The first four being population estimates while the last one being a full-scale census based on direct visual count. This information is summarised in the following table:

*Paper submitted at the 3rd All India Conference on Desert Technology, held at Bhavnagar in April 1983.

Table 1

Wild-ass Census—from the year 1946 to 1976

Year	Enumerator	Censussing method used	Wild-ass population
1946	Salim Ali	Estimate	3000 to 5000
1956	Wynter-Blyth	Estimate	about 4000
1962	E.P. Gee	Estimate	860 to 870
1967	Gujarat Forest Department (in association with M.S. Dhartnakumarsinghji)	Aerial Survey	362
1976	Gujarat Forest Department	Direct count	720

Other Wildlife in the Desert:

During the 1976 census other wild animals were also counted besides the wild-ass. They included Nilgai-76, Walves-61, Chinkara or Gazelle-191, blackbucks-9, Jackals, foxes and others-114. Many species of water birds are also seen in good concentration near Nimaknagar in the little Rann of Kutch. Most of such birds are winter migrants.

Dangers facing wild—ass population:

Gujarat State is a forest-poor state, with only 10 percent of its land under forests half of which is without any appreciable tree-cover. With less forests, the wildlife populations are also limited. Nevertheless, it is noteworthy that Gujarat can take pride in its rich variety of wildlife, even if in modest numbers. It is also a fact that the wildlife in state is at present under severe survival stresses on account of poaching, habitat destruction and heavy

disturbances caused by roads and traffic in their habitat. These decimating factors are adversely affecting wildlife population. The Indian wild-ass is no exception to these adverse factors.

In the case of wild-ass it is true that at present they are under no threat from the poachers but the maldharis-the nomadic cattle graziers are indeed a real threat to them. The maldharis and their cattle have been encroaching on the wild-ass habitat especially on the bets (grassy islands) inside the Rann of Kachohh. The ever multiplying number of salt pans in the little rann and consequent increase in human and vehicular traffic is also restricting the growth of wild-ass population. From times immemorial, the wild-asses lured by green pastures, have been occasionally straying in the bordering villages. However, recently some interested quarters have been giving exaggerated accounts of damage to crops by wild-asses.

Second Wild-ass Census—1983

Gujarat Government has arranged for the Second wild-ass census on 15th and 16th February 1983. Largest ever number of enumerators were pressed in service during this count. The census work was under-taken through the state Forest Department; the Chief Co-ordinator of the Census being Shri B.P. Lakhani, the Chief Conservator of Forests, Wildlife, Gujarat. The entire wild-ass habitat the great and little Ranns, within and outside the wild-ass sanctuary was divided into three zones for efficient organisation, with their headquarters at Radhanpur, Dhrangudhra and Bhachau. These zones were further divided into 14-sub-zones while the sub-zones were sub-divided into blocks comprising of primary census units. In all, 61 blocks and 219 primary units were formed, while the personnel deployed was about 700. During this census other wildlife beside wild-ass was also to be enumerated.

Results of Second Wild-ass Census—1983:

The massive census operations to count the number of wild-asses in the Rann of Kachchh concluded on 16th February 1983, after two days of direct visual count. The operations covered both the Ranns i.e. the little and great Ranns of Kachchh covering the districts of Kachchh Rajkot, Surendranagar, Mehsana and Banaskantha.

The Indian wild-ass also called Indian onager is one of the rarest animal surviving now in the world desert habitat. Along with the censusing of the wild asses, the enumerators also kept a count of the other wild animals found in the area. These included Nilgai, Chinkara, Black-buck, Wild Boar, Hyaena, Wolves, Jackals, Foxes, Desert cat, Porcupine, Hare etc. Fifty six species of birds were also identified.

Table 2
The results of Wild-ass Census, 1983

Sl. No.	Species	Numbers
1.	Wild Asses	1989
2.	Chinkara	906
3.	Nilgai	687
4.	Blackbuck	3
5.	Wolves	65
6.	Wild Boar	87
7.	Hyaena	20
8.	Jackal	153
9.	Foxes	54
10.	Desert Cat	7
11.	Hares	168
12.	Others	33

It is noteworthy that the number of wild asses in 1983 have almost trebled, compared to the 1976 census (720). Like wise there is a sizeable increase in the numbers of other animals, over the previous census figures. The main reasons being inclusion of more areas in the Greater Rann of Kachchh and refinement of census techniques, better protection and improved management practices.

This census was also aimed at assessment of further management needs to conserve the wildlife in the desert ecosystem which is unique in many respects. The census brought out the facts beyond doubt that the desert ecosystem, more particularly in the Greater Rann of Kachchh is varied, fascinating and in need of urgent protection. Desert ecosystem is a fragile ecosystem, where slightest disturbance in it due to a variety of cause such as depletion of vegetation or heavy vehicular traffic etc. can cause great decimation of the rare desert fauna.

The state Government has always appreciated the importance the rare and endangered species of the State and has earned Worldwide distinction in the field of Wildlife management, keeping with this policy of wildlife conservation the State Government will be taking necessary steps, very soon, to preserve this unique desert ecosystem. A Desert National Park in the Greater Rann of Kachchh for the purpose will be established soon, as was announced by the State Forest Minister in his press conference at Gandhinagar on 18th February, 1983.

Daily Cycle of Activity of the Dorcas Gazelle in the Thar Desert, India

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Department of Biosciences, Saurashtra University Rajkot India

Abstracting keywords : Activity Cycle, Gazelle

Introduction

The dorcas gazella, *Gazella dorcas christii* Blyth (Groves, 1969) occurs in the desert of Rajasthan and Gujarat (India) and Sindh (Pakistan). In India it is known as Chinkara or the Indian gazelle. This medium sized animal shows some behavioural adaptations for the thermoregulation in the desert. Nothing is known about such adaptations in the case of *G. d. christii* in India. Daily activity cycle of *G. d. dorcas* L. in the Sudan has been studied by Ghobrial and Cloudsley—Thompson (1976).

Methods

The activities of total 225 dorcas gazelles were observed in the natural conditions at various places in the Thar desert (Rajasthan, India) during various seasons of years 1980 and 1981. The time budget of ten animals was studied. The air-temperature was recorded from 05.00 hours to 18.00 hours. The behavioural activities have been observed with the help of binoculars (7 × 50 mm) and from the hide in certain instances. The observations recorded during summer are presented here.

Observations

(I) Activity:

Maximum temperature in summer was 45°C. During morning hours the gazelles were found most active between 05.00 to 11.00 hours (Indian Standard Time). During this time the temperature was raised from 25°C to 38°C. The gazelles devoted their 43 to 72% of the morning time in the feeding and rest of the time in searching the food. One herd consisting of five animals was followed and it was found that in search of food they moved to the distance of three kilometers.

The temperature raised up to 42°C at noon and most of the gazelles were found taking rest under the shadow of *Prosopis cineraria* from 12.00 to 16.00 hours. While taking rest

only 2% of the gazelles were found sitting (may be sick or weak animals). Most of them were standing and a few animals were moving slowly from one tree to another tree. The gazelles do not lay down probably because they do not want to gain any energy from the hot sand by the conduction.

The gazelles were again busy in feeding from 16.00 to 19.30 hours. They were found to take rest mainly under the bushes of *Cyperus decedus* plant during the night. During this time they were found sitting and the air temperature decreased to 25°C.

(II) *Behaviour:*

Defaecation: Heaps of the faeces were not found at any one place. The gazelle was found to pass the faeces anywhere near the feeding place or on the way when it is moving from one place to another. The same spot was not used for defaecation.

Chewing the Cud: Majority of the animals were found to chew the cud while moving from one food plant to another and while taking rest.

Standing: Gazelles were found to stand under the shadow or near the feeding site. Gazelles were used to keep their bodies at right angle to the wind direction and expose larger area of the body to the wind currents while standing in the shadow. Sometimes the gazelles were found to stand at the top of the sand mounts and keep their bodies in the said fashion. However, I was failed to observe the gazelles either laying down during the hottest part of the day or their heads facing the sun described by Ghobrial and Cloudsley—Thompson (1976).

Laying: Gazelles were found laying down during the night only.

Drinking: Local people known as 'Bisnoi' informed that the gazelles drink during the night from the temporary ponds locally known as 'Nadi'. They drink from the artificial reservoirs meant for the camel. The duration and frequency of drinking could not be recorded.

Feeding: Scarcity of food compels the gazelles a greater period of foraging in the summer months. The gazelles were found to feed during the day but according to the local people they also raid the crops in the monsoon during the night. The food plants of the chinkara includes the leaves, flowers, and fruits of mainly *Tecomella undulata*, *Aerva tomentosa*, *Prosopis cineraria*, *Acacia jecomonsi*, *Crotalaria burhia*, *Zizyphus nummularia*, *Calotropis prosera*, *Cynodon*, *Dactyloctenium* and *Cyperus* spp. The crop species liked by the gazelle include *Phaseolus aureus*, *P. aconitifolius*, *Cyamopsis tetragonoloba*, *Brassica campestris*, and *Cicer arietinum*.

During feeding an alpha male acquired the central position in a herd and enjoyed the best available food.

Interherd confrontation: Interherd confrontation was observed when two herds approached the same feeding ground. Mainly a dominant male of one herd tried to drive away the members of another herd. Such a confrontation took about 2% of their activity time. The looser herd immediately moved to the another feeding ground.

Antipredatory behaviour: The gazelles were found to become alert by viewing any unusual person (other than local) from a safe distance, one or more adult animals of a herd used to keep constant watch on the danger and when they became suspicious they emitted alarm signals by making sneezing noise and stamping the ground with the fore feet. By this time all the herd members started watching the danger and decamped totally from the vicinity.

Conclusion

The daily activity cycle and the time budget for various activities of the dorces gazelles clearly depend upon the ambient temperature which varied with the season and time of the day. The dorces gazelles, thus show the thermoregulatory behaviours to avoid rigours of the desert climate. The availability of the food also plays an important role to adjust the daily activity cycle of the dorces gazelle.

Acknowledgements

I am very much thankful to Prof. S.C. Pandeya for encouragement. It is pleasure to thank the friends who helped me in the field work. This study was carried out as a part of the Major Departmental Research Project supported by the University Grants Commission, New Delhi.

Abstract

The diurnal activity of *Gazella dorces christii* Blyth in the Thar desert (India) was studied. The gazelles were busy during 05.00 to 11.00 hours and 16.00 to 19.30 hours. The minimum temperature was 25°C early in the morning and maximum temperature was 45°C during the noon. The periodicity and several types of behaviours related to its activity were described. The activities are related to the diurnal and seasonal ambient temperature changes.

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The Gir (Asiatic) Lion (*Panthera leo persica*—Meyer)

By

M.A. RASHID

<i>Local Names:</i>	Hindi	—	Sher Babar, Sinh
	Gujarati	—	Sinh, Untio Wagh (i.e. Camel tiger)
	Kathiawari	—	Sawachh

Introduction

1. Of the 500 and odd species of mammals in the Indian sub-continent, the lion is perhaps the most lordly and majestic. We Indians have held it in veneration since mythological times. It was the 'vahana' (mount) of Goddess Durga who rode on a lion in her fight against the forces of darkness and barbarism. It is because of this association that the lion has become the symbol of 'Dharma' (righteousness). In the days of yore, kings when dispensing justice, sat on a throne which was called 'Sinhasana' (the seat of the lion), upon which rested justice and fair play. This is how the lion's head has come to adorn the Ashoka Pillar which is the national emblem of the Indian Republic.

Origin and World Distribution of Lions—past and present

2. Like most other species of Indian wild life, the lion is a migrant into India. Fossil remains unearthed in England, Germany and France indicate that the now extinct cave lion originated in Central Europe in prehistoric times. In the more recent historic times, it was found in the Balkans and the valley of the Danube, spreading across South Germany, Austria, Hungary, Yugoslavia, Rumania and Greece. Herodotus narrates attacks by lions on the baggage camels of Xenophon in Macedonia.

3. From its original home in Central Europe, it spread south-eastwards into north-western Asia from where it ultimately diverged in two opposite directions, viz. westwards through Egypt into Africa, where it subsequently established its dominion practically throughout the entire continent excluding the equatorial forests, and eastwards into India through Persia and the north-western passes.

4. The lion's range of distribution in Asia covered Mesopotamia, Arabia, Persia and the Indian sub-continent where it was fairly abundant upto the end of the 18th century A.D. During the 19th century however, its population in Asia steadily declined as a result of

relentless persecution by man and, by the turn of the century, it was practically driven to the verge of extinction. It is significant to note that slowly but steadily the lion disappeared from Greece, Mesopotamia, Egypt and Persia even as these, human civilizations reached the zenith of their glory and then declined into oblivion due to the havoc they wrought on their natural environment through their own indiscretion and folly.

5. In the early 19th century, lions were still fairly numerous in many parts of Iraq while they existed into the present century in some remote parts of Arabia. In 1903, Col. Stewart, who had spent many years in Persia, reported the presence of lions in the extreme south of that country near the Persian Gulf and adjoining Arabia. A lion cub was brought to an Arab village near Sanniyat in Mesopotamia in 1916. In the same year, a lion was shot in the Wadi Marshes near the Pusht-e-koh mountains. A letter published in London Times reported the sighting of a lion near Ahwaz in 1917. All these records relate to South-West Persia. A party of American engineers reported the presence of lions in the same area as late as 1930. R.N. Champion-Jones claimed to have seen in a single specimen on the banks of the Kharki river in 1941. The last lion seen and reported in the area by a party of the Indian Field Survey Company engaged on survey work was in 1942.

Lion distribution in India

6. The lion entered the Indian sub-continent from Persia through the north-western passes at least 6000 years ago, if not earlier, as borne out by the remains of the Indus Valley Civilization excavated in Sind and Baluchistan and gleaned from the ancient Hindu scripture the Vedas. In the times of Buddha *Circa* 600 B.C., it roamed over the entire Indo-Gangetic plain extending from Sind in the west to Bengal in the east and from the Himalayan foothills in the north upto the river Narbada in the south. The total absence of the lion from the region south of the Narbada further indicates that India was not its original home, for in that case, it would have spread over the entire Indian Peninsula, and perhaps into Burma also. This limited distribution of the lion in India also lends support to the theory that it was a more recent migrant into India as compared with the tiger which is believed to have migrated into India from its original home in the icy wastes of Siberia and Manchuria through the north-eastern passes, much earlier than the lion.

7. The early records of the lion in India make interesting reading. Emperor Jehangir, a great naturalist who wrote detailed memoirs regarding the wildlife of his time, hunted a lion in forest near Malwa in 1617. He had also recorded a lion hunt by his father Akbar. He had also permitted Sir Thomas Roe, the first English Ambassador to India, to kill a lion in his camp near Mandu in Central India. Rev. Terry (1650) also encountered lions frequently while passing through the vast jungles of Malwa. In 1822 they were reported to be fairly abundant in Saharanpur, Moradabad, Rampur and in North Rohilkhand. Col.

Stewart reported a lion hunt south of Allahabad in 1853. A lion was shot at the 80th mile from Allahabad on the Jabalpur railway in 1866. The last lion was shot in Central India near Guna in 1873 and the last recorded sighting of a lion in this region was in 1884. Nothing was heard about lions thereafter for the next 40 years or so when 3 lions were shot near Kota in 1922, another near Jhansi and in Panna State in 1920. But these were probably African lions experimentally released in the Shivpuri forest by Maharaja Scindia of Gwalior around 1920.

8. Outside the Kathiawar peninsula, lions disappeared from western India around 1840. They were last seen in Haryana in 1834 and in Kot Diji east of Mohen-jo-Daro in 1842. In eastern India, the last lion was seen near Palamau in Bihar around 1814.

9. The occurrence of lions in fairly good numbers was recorded along the banks of the Sabarmati river and around Mount Abu in 1830s. Hunting lion from horseback was the favourite sport of British cavalry officers around Deesa right upto 1832. The last lion was shot by Col. Heyland of the Old 1st Bombay Cavalry on the Deesa race course in 1878. Blanford has recorded the presence of lions in and around Gujarat during the last century at the following places, viz. Palanpur (1814), Ahmedabad (1830), Baroda (1832), Ahmedabad (1836), Anadare on the Rajasthan border (1872), Deesa (1878), Palanpur (1880) and Mount Abu (1881).

10. Map 1 shows the distribution of lions in India during 19th century A.D.

11. In Kathiawar, lions were mainly centered in the Gir which was then a compact block of forest of over 2000 km² in extent and the Girnar hills of the princely State of Junagadh. They were also found in the hilly forests of Barda and Alech between Porbander and Jamnagar. Sporadically, they were also found in the Sihor hills, around Chotila and Jasdan and a few other places in the north as far as Dharanadhra. The late Jam Sahib Vibhaji of Nawanagar as a young man hunted lions in the Barda hills while the late Thakore Jaswantsinji of Bhavanagar shot one near Sihor in 1850's.

12. In the early part of this century, the Gir forest was connected with the Girnar and Mitiyala hills by corridors of rough semiwooded and sparsely populated country, as also with the Barda and Alech hills, and a wild wooded strip between Dhank and Chorwad along the sea coast. This enabled the Gir lions to commute freely to and from these pockets at will. During the monsoon months in particular, lions tended to move away from the interior of Gir forest in search of more favourable conditions and to escape from the pastering flies and mosquitoes harboured by the excessive humidity and the dense rank growth.

13. Lions deserted the Barda and Alech hills towards the latter half of the 19th century, probably as a result of the constant disturbance caused by the British army chasing

Wagher outlaws hiding in these hills. A pride consisting of a lion, lioness and a cub was seen in this area in 1879, but before the Porbander State authorities could take steps to protect them, the animals were killed by the Rabaris and the Nawanagar State Police stationed there.

14. Lions started appearing in the Mitiyala forests from 1917 onwards. 23 lions were shot in this area between 1920 and 1946. Lions were last seen in this area during the 1955 census.

15. Lions were frequently seen in small numbers in the Girnar hills adjoining Junagadh till 1963. Nine lions were captured from this area between 1944 and 1958. Wild lions in Girnar were often attracted by the roaring of captive lions kept in the Sakkarbagh Zoo maintained by the Forest Department on the outskirts of Junagadh town. However, no lions were recorded from this area after 1863 till a few stray individuals were again located there during the 1974 census.

16. In comparison with the tiger, however, the lion was distinctly at a disadvantage in its struggle for domination and survival. The lion's comparative boldness and lack of cunning, as well as its herding instinct and its preference for an open habitat, made it an easy prey to the decimating influence of a rapidly increasing human population and the inexorable advance of civilization. With the passage of time, the lion was rapidly exterminated not only in Europe and over the greater part of South-West Asia, but also in India, where its extermination was accelerated with the advent of the British. Many of the early British army officers and civil servants in India played havoc with wildlife and there are numerous instances on record to prove that they commonly indulged in wanton wholesale slaughter of game just for the fun of it. Thus, for instance, Kathiawar, a British cavalry officer is reported to have shot as many as 80 lions during his brief stay of 3 years in that region. On one occasion, 14 lions were shot in the Gir forest within the short period of 10 days. Their numbers were further depleted by large scale poaching. Similar thoughtless butchery went merrily in the rest of the country in respect of other game animals and birds also, such as the tiger, rhino, elephant, black buck, water fowl, Imperial sandgrouse, etc.

17. With the steady deforestation of more and more areas for cultivation, the protective corridors radiating from the Gir forest have now mostly disappeared and the present population of 200 and odd lions is now more or less confined to the Gir Sanctuary of 1412 km².

(D) **Lion Races**

18. In his article "The Lions in India" published in the January/February, 1982, issue of the Australian magazine "Hemisphere", Prof. Colin Groves has distinguished the following races (sub-species) of the lion viz.—

<i>Panthera leo persica</i>	—	Asiatic (Gir) lion
<i>Panthera leo nubica</i>	—	Sub-Saharan African lion
<i>Panthera leo melanochaita</i>	—	Cape lion (now extinct in the wild)
<i>Panthera leo leo</i>	—	Barbary lion (now extinct in the wild)

(F) The Gir Forest Habitat

19. Unlike the tiger which usually frequents dense forests with adequate cover, the lion prefers an open habitat of the savannah or scrub type bearing sparse tree growth. Its present habitat, viz. the Gir forest of Saurashtra (now in Gujarat State), is eminently suited to its requirements. It is compact block of forest 1412 sq. km in extent. The terrain is rugged and hilly, with a maximum elevation of about 600 m above mean sea level. The whole forest area is divided into 9 catchments of the following perennial rivers, viz. (i) Hiran, (ii) Shingavadi, (iii) Shingavado, (iv) Machhundri, (v) Raval, (vi) Malan, (vii) Datardi, (viii) Shetrunji and (ix) Popatadi.

20. The underlying rocks are of volcanic origin and are mostly made up of basalt or dolomite with a whitish greenish tinge. Sandstone and limestone are also found in places. The soil is mostly black cotton but reddish soils and sandy loams also occur.

21. The maximum and minimum temperatures vary from 41°C in May to 7.8°C in January respectively. The average annual rainfall is about 800 mm, decreasing from about 1016 mm at Sasan in the south-west to 650 mm at Jasadhar in the east. The monsoon is irregular, commencing sometimes at the beginning of June and at others not till late July or early in August. The climate is fairly salubrious and healthy, except from August to December when malaria is common throughout the tract. The area is accessible by rail even during the rains, the railheads being at Sasan and Jamwala. The forest area is served by a network of fair weather roads. The best time for visiting the area is between January and March. The nearest aerodrome is at Keshod which is 90 km from Sasan via Verawal. There is a daily air service between Bombay and Keshod during the fair season. Please see Map 2 location of the area

22. The Gir forests are of the dry mixed deciduous type fringed with thorny scrub. On better soils in the west, the predominant species is teak (*Tectona grandis*) which forms up to 70% of the crop, though the timber is poor in size and quality. It is associated with other species such as Sadad (*Terminalia crenulata*), Behda (*Terminalia bellirica*), Jamun (*Syzgium cumini*), Timru (*Dyospyros melanoxylon*), Semal (*Bombax ceiba*), Karaya (*Sterculia urens*), Khakhar (*Butea monosperma*), Dudhlo (*Wrightea tinctoria*), Aal (*Morinda tinctoria*) etc., with bamboos (*Dendrocalamus strictus*) in patches. The eastern portion contains more open miscellaneous forest with sparse and stunted tree growth with long stretches of grassy areas. The thorny scrub consists of Acacias (mainly *Acacia nilotica* and *Acacia senegal*), Bor (*Zizyphus* species), *Carrissa opaca*, *Xeromphis* species, etc. The good quality fodder grasses

are Saniar (*Schima nervosum*), Zinzvo (*Dichanthium annulatum*), Moshti (*Iseilema antheperoides*) and dheraf (*Chrysopogon montanus*).

23. The tract is sparsely populated. Nomadic graziers (maldharis) maintain large herds of cattle. Their temporary camping places in the forest are locally called 'nesses'. Some of the principal 'Nesses' in Gir forest are Kansaria Nes, Sandbeda Nes, Devalia Nes, Kapuria Nes, Gadakia Nes, Dedakdi Nes, etc. The nesses invariably attract the lions who remain in the vicinity of the same in the hope of lifting stray animals to supplement their natural prey consisting of cheetal, sambar, wild boar, bluebull, etc.

24 The changed conditions produced by the changing seasons also influence the movements of the Gir lions. During the hot weather, the Gir forest is bare and open, the water supply being localised to a few deep pools in the Hiran river and the perennial nalas. Herds of game and cattle congregate at such pools during the parched summer months, followed by their predator, the lion. At this time of the year, unless it is cloudy, lions retreat into shady cover fairly early in the day and rest there the whole day long until sunset. With the advent of the rains, however, the nature of the whole environment changes. The days of torrid heat are over. There is water everywhere and the parched countryside is now covered with an abundance of succulent vegetation, resulting in the wide dispersal of herbivorous animals. Following their prey, the lions also stray out of their forest limits into the neighbouring village lands. Being pestered by flies and mosquitoes which infest denser forests during the rainy season, lions prefer to roam in open scrub, grass and even cultivated lands to escape from these pests.

(F) External characters and physical structure

25. The average length of the Indian lion is more or less the same as that of the African lion – a little over 9'. The largest recorded measurements are 9'-7" for an Indian lion and 10'-7" for an African lion. A big lion weighs round about 225 kg. Lionesses are smaller and lighter and lack manes which so vividly characterise the older males, though sometimes they may have longish hairs on the face. Cubs are also maneless and sometimes even grown up male lions have hardly any mane. On the average, the Indian lion has comparatively a scantier mane than its African cousin. On the other hand, the Indian lion has a fuller coat, a longer tassel of hair at the end of its tail, a more pronounced tuft of hair on the elbow joints and a prominent belly fringe. The mane is light or dark, rarely quite black, and may be fully developed or scraggy. The mane of the captive lion is usually longer and better developed, since it does not suffer damage by getting entangled on thorny bushes etc. as happens in the natural state. The lion is the only member of the cat family having a thick tuft of black hair at the end of the tail; both lions and lionesses having this. Lion cubs have brown spots or stripes on their tawny coats; but these gradually disappear with

26. Like the other members of the cat family, the physical structure of the lion is specially adapted to its carnivorous habits, there being a marked accent on the perfect development of those characters which mark the predator par excellence, viz. claws especially adapted to strike and hold a struggling prey, and teeth especially designed to bite into, cut up and tear its flesh, coupled with a unique combination of grace, agility, speed, brute strength and ferocity.

27. The jaws of the lion are very powerful and are provided with 3 different types of teeth. In the front portion of both the upper and lower jaws are small teeth (usually six in number) called incisors which are useful in gnawing the bones and scraping away the tendinous attachments of the muscles. On both sides of the incisors in both the jaws, there are large strong and well-developed teeth which are known as canines. When the jaws are closed, the canines interlock due to the peculiar mode of articulation of the lower jaw which moves on a small transverse hinge. The canines are developed into enormous separated fangs which, together with the incisors, enable the lion to bite and firmly seize its prey. The cutting up of the flesh morsels is done by the cheek teeth which have conical crowns raised up into pointed blades. There are 3 cheek teeth in the upper jaw and 2 in the lower. The sharp-bladed cheek teeth work against one another like scissor blades and help to cut up and divide the flesh. The lion has 26 teeth in all.

28. Like the other members of the cat family, the lion's tongue is provided with numerous and prominent conical papillae encased in horny pointed sheaths which cover the tongue and stick into one's fingers like so many pins. The function of these numerous sharp and rigid points is purely mechanical. They give the tongue the action of a rasp, this being an adaptation for licking the bones clean of flesh. This rasp-like tongue is also used for tidying the cubs, cleaning the claws and licking wounds. To most animals, the tongue is an organ of taste; but carnivorous animals like the lion, which tear to pieces and swallow their food in greater chunks, can scarcely derive much enjoyment from its taste. The taste glands of a lion's tongue are set mostly along its margin.

29. The feet and claws of the lion are also well adapted to its mode of hunting, the essence of which is stealth of approach through noiseless stalking of its prey. The soles of the feet are padded and the claws (18 in number, 5 on each of the forefeet and 4 on each of the hind feet) are retractile, i.e. they can be exposed or withdrawn into their sheaths at will. When walking, the claws are withdrawn and the animal moves silently on its pads. The claws are especially adapted for catching hold of the prey and tearing it to pieces. Each claw is curved and has a deep groove which helps to scoop out the flesh. Due to the presence of putrefying flesh and other decaying matter in these hollow grooves, the claws always harbour bacteria and other germs. As a result, any wounds inflicted on a human being mauled by any of the larger members of the cat family, invariably causes blood poisoning.

The foot print of the lion is known as a pug mark ('sagad' or 'pagarun' in Gujarati). The pug mark of the hind foot is smaller than that of the forefoot due to greater weight coming on the front limbs. The pug mark of a male lion is comparatively bigger and the impression of the pad is almost round, while the pug mark of the lioness is smaller in size with the pad impression oblong in shape. The pug mark of an old animal may show wrinkles in the impression of the pad. The average pug mark of a full grown lion measures about 13×14 cm while that of a mature lioness measures about 10.5×11.5 cm. The largest diameter of the pad is about 9 cm. When walking normally, the lion generally leaves a double track, since the hind foot is not placed exactly over the print of the fore foot. When stalking its prey, it crouches closer to the ground and moves forward practically on its toes, the thickly cushioned pads muffling all sound. This digitigrade movement inclines the body forward and makes for greater agility and speed of movement, culminating in the lightning charge which seals the fate of its unfortunate victim in a flash.

30. The lion, a nocturnal hunter, relies for its hunting mainly on its sense of hearing which is very strongly developed, and, to a lesser extent, on its vision and sense of smell. The large upstanding ears of the lion are capable of picking up the feeblest of air borne sounds and its sense of direction in respect of the sounds reaching its ears is remarkably accurate. The eyes are large and provided within with a well-developed system of muscles enabling it to contract the pupils to small circular openings in bright light and thus protecting the eyes from glare. In the dark, the pupils dilate to allow the maximum amount of light to enter the eye. The lion's eyes are thus well attuned to work in the dark and are quick to detect the movements of its nocturnal prey. The sense of smell, which is poor in the case of the tiger and the panther, is comparatively better developed in the lion and is also believed to be used as an aid to hunting. The sense of smell is, however, highly developed in the herbivorous animals on which it preys and the lion always takes good care to bear in mind the direction of the wind when stalking its prey. The lion's long whiskers and tufts of bristles on its forearms are sensory tactile organs which through connecting nerves flash to the brain impressions gathered through feeling and touch. On the whole, the hunting of other animals for food requires a high degree of proficiency and beasts of prey such as the lion display a level of intelligence and a degree of brain development surpassed only by man and the higher apes.

31. The adult lion has a tawny colour, but the cubs are either spotted or striped. This indicates its descent from spotted or striped ancestors. The uniform tawny colour of the lion harmonises with the surrounding colour tones of its savannah or scrub habitat and provides a fairly effective camouflage. The coat in some specimens is mixed with black and grey hairs and rarely one comes across a lion with a blackish coat, commonly known as a 'black lion'.

(G) **Habits and Behaviour**

32. The Indian lion does not differ much in habits from its African counterpart. Of all the members of the cat family, lions are undoubtedly the most sociable creatures with strong family ties, and consequently they are also the most noisy and vocal. This exceptional trait of character is perhaps attributable to their herding instinct which calls for a greater need for inter-communication. Lions usually live and hunt in family parties known as 'prides' comprised of about a dozen or even more individuals, large and small. One seldom fails to hear the roaring of lions on the prowl during the night in forests frequented by them, more noticeably at dusk and again just before daybreak. They prey mainly on game and cattle, finding the latter much easier to kill than the wild ungulates which constitute their natural prey. The hunt is planned methodically and with intelligence, the males generally driving the quarry towards the positions where the females are waiting in concealment to pounce upon the unsuspecting victims as they come within striking distance. They kill about once a week on the average. Unlike tigers and panthers, lions usually do not conceal their kills by covering them with leaves, etc.

33. Like cats, lions are affectionate creatures, particularly towards each other. If they have been separated for a while, they will rub faces together for a long time when they meet again. There is strong mutual affection between the parents and their offspring. Lions may be seen threatening each other, but they rarely fight among themselves, except when aroused by mating instincts. The behaviour between different groups of lions is also both interesting and amusing. For instance, if some hungry lions on the prowl happen to come upon a group that is already feeding on a kill, they will look on enviously, obviously wanting to join in the feast but hesitating to do so as they are not very sure what kind of a reception they would get from the group at dinner. After some hesitation, they will gather a little courage and move in gradually and tentatively, a few inches at a time. If in this process, a member of the feeding group happens to look round, the intruders will stop in their tracks and stare up innocently at the sky as if to say: "Do you think it will rain today?". But as soon as they are unobserved, they will again edge forward a little farther. Usually, the feeding group is resentful at this intrusion at first; but after a while, after they have eaten enough, they slowly relent and ultimately allow the intruders peaceful access to the remnants of their meal.

34. It is very unusual for lions to climb trees. Being heavy and cumbersome, they are just not built for such gymnastics. African lions are, however, known to climb trees occasionally either to escape from the heat or to find a good vantage point from which to look for game in the surrounding countryside. For instance, the Lake Maniyara region in Tanzania is popular with tourists for its tree-climbing lions.

35. There appears to be no rigidly fixed breeding seasons for lions. In the Gir forest, many lions mate between October and November and the young are produced round about

January-February. The gestation period is 112-116 days. The young are produced at intervals of about 22 months. The normal litter is of 2 cubs, but sometimes it may contain 3 or even up to 5 cubs. Unlike the male tiger, which normally deserts its mate shortly before or after the cubs are born, the male lion remains with the family and though it takes little interest in the offspring, it does help to defend them and to procure food for them. Like the tiger, the lion is believed to have a life span of up to 30 years. The male lion is in his prime at the age of 5, while the lioness is said to have first litter when she is $2\frac{1}{2}$ to 3 years old.

36. Lion cubs are usually born blind and helpless, though some cubs can see at birth. Dentition is visible in the cubs at 15 days. The task of rearing up and training of the cubs devolves mainly on the mother. It is always she who keeps the nursery clean and attends to their toilet by licking them with her rasp-like tongue until they become capable of licking themselves or each other clean. When they stray from their lair, she brings them back, carrying them gently in her mouth by the scruff of the neck just as a house cat does. The young cubs are ever insistent in their demands for her affection by wailing and screaming. They cry not only when hungry but also when cold or when left alone. For the first few days, she remains with them constantly but later hunger compels her to go out and hunt. She continues to nurse the cubs on milk till they are about $5\frac{1}{2}$ months old. Before they are weaned, the cubs begin to scrape off fragments of flesh from the prey she brings home. This is their introduction to meat-eating. Training in hunting and stalking is also imparted to them right from the nursery stage. They learn to crouch and leap at each other. What seems pointless play with their mother's tail is in fact gaining of skill in the art of approach and attack. As they stalk its flicking tip, leap at it as it is whisked away, and seize and worry it, they are unconsciously practising the elements of their deadly craft. When strong enough, they are taken out by the mother or by both parents on family hunts, during which the growing cubs gain valuable practice and experience in the art of stalking and killing their prey. When a family of lions is hunting, the hunt usually takes the form of an organised drive. Some of the members drive the quarry in the direction of others lying in wait to intercept and bring down the victim. Generally, in such family hunts, it is the lion who drives the prey towards the lioness which lies in ambush while the cubs waiting by her side rush in to tear at and feed on the prey.

37. Animals that are fairly closely related are capable of being inter-bred to give offspring of mixed blood. Lions and tiger have been bred together. Their hybrid progeny, which resembles both parents, is known as 'liger' when the father is a lion, and as 'tigon' when the father is a tiger. Such hybridization, however, is only a matter of scientific curiosity and serves no useful purpose. In fact, it is genetically undesirable. The Sakkarbagh Zoo at

Junagadh maintained by the State Forest Department is an internationally recognised centre for the supply of pure-bred Asiatic lions.

(H) Lion Population in Gir Forest and Census Techniques

(i) Estimates of lion population from 1890 to 1963:—

38. Authentic records are not available as regards the past lion population in the Gir forest. However, as early as in the year 1880, Col. Watson estimated the lion population in Gir forest to be "not more than a dozen animals". The official estimate of the then Junagadh State given out in the year 1893 indicated a total figure of 31 animals in the Gir forest. Whether Col. Watson's estimate was correct or whether Junagadh State's estimate was correct, it is evident that the number of lions in the Gir forest was very small and this species was on the verge of extinction. Lord Curzon who visited Junagadh State during this period urged the Nawab of Junagadh to take steps to protect this fine animal from extinction. The Nawab immediately agreed and imposed a ban on shooting of lions. This was the first attempt towards protection of lions in the Gir forest. However, during the great famine of 1899 and 1900, almost all the wild ungulates and bulk of the domestic stock in Gir forest perished for want of water, and immediately thereafter the natural prey for lions became scarce. As a result, lions had to search for any available food. Large scale damage to domestic livestock is reported between the years 1901 to 1904 in the surrounding areas of Gir forest. Maddened with hunger, the lions became so bold that they even entered villages during day time, attacking cattle and human beings during these years. Reports show that in the year 1901, two women and a boy were killed and a man was seriously mauled around the villages south of Gir. In the next year, two men and a boy had been killed as far as in Kodinar Taluka. In Gir proper, 31 men had been killed and 8 mauled in the year 1901 and though no figures are available for the years 1902 and 1903, it is unlikely that there was any great decrease in the deaths during these years, as in the year 1904, 29 men were killed and 11 mauled. This state of affairs led the Nawab to start shooting the lions. Thus ended the first attempt at the protection of lions. However, the protection afforded to the lions during the short period ending 1904, showed that the lions had increased up to 60 to 70 in the year 1905. According to Major Carnegie, the official estimate of the then Junagadh State for the same area was about 100 animals.

39. For the years between 1904 and 1911 when the Nawab died and the British took over the State administration during the minority of his successor, there are no records available regarding lions, although according to Mr. Wallinger, the Chief Forest Officer, in the year 1913, about 12 to 13 lions were being shot annually. It is interesting to note that after the year 1900, lions took to killing cattle and human beings due to non-availability of their natural prey—wild game—which perished in the great famine of 1899 and 1900. By the year 1911, the wild ungulate population in Gir forest had probably picked up and herds of

buffaloes had established in good numbers. Thereafter the lions were never heard of as a menace to human life, save in case of wounded animals or a lioness with cubs.

40. During the period of British Administration, i.e. from the year 1911 onwards, shooting was rigidly controlled. The Chief Forest Officer of Junagadh State, Mr. Wallinger, after a tour of the area reported in the year 1913 that there were not more than 20 animals in the Gir forest. This was supported by Mr. Brooke-Fox, the Chief Engineer of the State, who was also a keen shikari. As a result of this report, Mr. Rendall, the Chief Administrator, imposed a complete ban on shooting of lions in Junagadh State and also urged adjacent States to do the same. In the year 1920, Sir P.R. Cadel stated that the number of lions in Gir forest was about 50. In the year 1922, the British Administration ceased and the new Nawab ascended the Gaddi and continued the good work of protection instituted by the late Nawab and the British Administration. Protection given to the lions for a period of 25 years yielded good results and by 1936 the lion population had substantially increased.

41. The figures of lion population given out prior to 1936, were only estimates based on personal knowledge and experience of the area and no technical survey or even a sample survey was carried out to arrive at these estimates. The first organised census to determine lion population in the Gir forest was held by the then Junagadh State in April, 1936. This census showed the following population:—

Males	Females	Cubs	Total
143	91	53	287

This census was based on counting and measuring the pug marks at water holes on the assumption that the lions must drink once but seldom more than once in 24 hours. About 700 labourers were employed to enumerate and collect measurements of pug marks from which the figure of lion population was arrived at.

42. Even after the increase in lion population during the period from 1911 to 1935, the protection given to the lions was not relaxed and shooting of lions was carefully controlled to not more than 3 mature male animals per year. However, outside the Junagadh State territory, some animals were regularly being shot, for which there is little record available. The next census was carried out by the late Mr. M.A. Witter-Blyth in April, 1950, on about the same lines as the census carried out in the year 1936, except that pug mark counting and measurements were taken, not at the water holes but on roads, paths and trails. This was because on water holes the ground is usually unsuitable for reception of pug marks, whereas roads, paths and trails, covered as they are with fine dust in summer months, would afford an ideal medium for recording pug marks. The result of this census was as under:—

Adult animals	Young animals	Total
179 to 187	87	219 to 227

This census included the adjoining areas of Baroda and Bhavnagar States, Girnar and Sama hills in addition to the Gir forest. In his report of this census, Mr. Winter-Blyth suggested that the lion census should be carried out at every 5 years interval. Accordingly, the subsequent census was carried out again by Mr. Winter-Blyth in April, 1955, exactly on the same lines as was carried out in the year 1950. The result of this census was as under:—

Male	Females	Cubs	Total
141	100	49	290

his census also included the areas of Baroda and Bhavnagar States and Girnar in addition to the Gir forest.

43. The next census due in the year 1960 was delayed on account of re-organisation of ex-Bombay State and formation of Gujarat State. The operation was actually carried out in the year 1963 by the Gujarat Forest Department. The method employed in the 1963 census was identical to the one employed by Mr. Winter-Blyth and consisted of counting and measuring pug marks along roads, paths and trails. The result of the 1965 census was as under:—

Males	Females	Cubs	Total
82	134	69	285

44. The result of the past estimates and the censuses can be seen at a glance in the following table. —

Year	Authority	Number of animals			
		Males	Females	Cubs	Total
1880	Col. Watson	—	—	—	About 12 (E)
1893	The then Junagadh State	—	—	—	About 31 (E)
1905	Major Carnegie	—	—	—	60 to 70 (E)
1905	The then Junagadh State	—	—	—	About 100 (E)
1913	Mr. Wallinger	—	—	—	Not more than 20 (E)
1920	Sir P.R. Cadell	—	—	—	About 50 (E)
1936	The then Junagadh State	143	91	53	287 (C)
1950	Mr. Winter-Blyth	179 to 187	—	40	219 to 227 (C)
1955	Mr. Winter-Blyth	141	100	49	290 (C)
1963	Forest Department, Gujarat State	82	134	69	285 (C)

Note: E = Estimated figure.

C = Census count.

45. All the above four censuses from 1936 onwards were carried out by indirect method, i.e., by counting pug marks of the right front paw of animals on roads, tracks, trails, water holes, etc., and taking the measurements of the pug marks through a large number of persons and determining the population therefrom. The pug mark census presumes that

- (i) the pug mark of each individual differs in dimensions,
- (ii) every animal would move during the course of night and would either go to water or to hunt and would cross a road, trail or track leaving a pug mark thereon, and
- (iii) cubs and sex of the adults can be distinguished from the shape and size of pug marks.

In all the previous censuses, large numbers of Forest Guards and labourers were employed to go out with bamboo splints in the early morning after all the pug marks were erased from paths, roads, trails, water holes, etc., on the previous evening. These enumerators took length and breadth measurements of the square formed by pug marks by breaking splints as per measurements of the pug marks they came across and brought back these splints tied in bundles. Each bundle of 2 splints gave measurements of the length and breadth of the pug marks of each individual animal. From these splints, the total population of the animals, the sex and the cubs were distinguished. This method of census entails, 2 to 3 days' field work and scrutinising the data so collected. This method as can be visualised, involves considerable human element. Some of the drawbacks of this method are:—(i) the measurements of pug marks are taken by illiterate Forest Guards and labourers (ii) in breaking the bamboo splints to take measurements of pug marks, some error is likely to take place; (iii) supervision on so many enumerators is difficult; (iv) the skill of the person in charge of the census operation in elimination of duplicate count of pug marks of the same animal, identifying pug marks of the same animal, identifying pug marks of other animals, such as panther, and determining sex and age of the animals plays a considerable part. All these human elements would obviously affect the ultimate result in determining the population.

(ii) Censuses based on direct visual count: —

46. Therefore in the next departmental lion census carried out in May-June, 1968, under the supervision of Shri M.K. Dalvi, IFS, Conservator of Forests, it was decided for the first time to adopt the direct visual count method which would ensure greater accuracy by reducing the possibility of errors to the barest minimum. The modus operandi was to congregate the entire lion population in the Gir forest by tying up live buffalo baits at fixed spots and then actually count them by posting observers at the selected locations. However, in order to determine the number of baits required and their locations, an initial pug mark

count according to the earlier technique was carried out. The result of the pug mark count was as under: —

Males	—	48
Females	—	80
Cubs	—	28
Total	—	166

On the basis of this preliminary census, about 75 locations were tentatively fixed for tying up live baits and two observers were detailed to sit up over the baits from 18.00 to 24.00 hours daily over a 5 day period and record the actual number of animals that visited the kills. The following particulars were recorded by the observers every day when a bait was killed by lions: (a) number of lions in the pride, (b) number of adult lions and their sex, (c) number of cubs and their approximate age and sex, (d) approximate time of arrival and departure of the animals, (e) any other remarkable trait observed.

47. This elaborate census which cost about Rs. 15,000/- yielded the following figures of lion population:—

S. No.	Range	Males	Females	Cubs	Total
1.	Sasan	7	19	27	53
2.	Visavadar	17	15	15	47
3.	Jamwala	16	13	0	29
4.	Chhodavdi	6	3	5	14
5.	Jasadhar	9	6	4	19
6.	Hadala	4	5	0	9
7.	Sarasia-Mitiyala	1	5	0	6
		60	66	51	177

K.S. Dharmakumarsinhji of Bhavnagar was associated with this census as a non-official observer and technical expert.

48. The next departmental census of Gir lions was carried out in May, 1974, under the supervision of Shri K.K. Acharya, IFS, Conservator of Forests, adopting the same technique with slight modifications. This census gave the following population figures:—

Adult lions		Sub-adult lions		Cubs	Total
Males	Females	Males	Females		
40	52	13	25	50	180

49. Apart from the lion population, an attempt was also made to estimate the population of the other major mammalian species occurring in the Gir forest by counting them on water holes. The result of this count was as under:—

Panthers	—	142	Four-horned antelope	—	979
Striped hyaena	—	63	Chinkara	—	195
Cheetal	—	4517	Wild boar	—	1822
Sambar	—	651	Langur	—	3450
Bluebull	—	1471			

These figures do not include the animals counted in the Girnar hills.

50. The last and the most elaborate census of Gir lions by the direct visual count was conducted in May, 1979, under the supervision of the author who was then working as Additional Chief Conservator of Forests, Wildlife, Gujarat State. Shri Shivbhadrasinhji of Bhavnagar and Shri Digveerendrasinhji I. Salanki of Bansda were associated with this census as non-official observers. This census, which cost about Rs. 45,000/—, gave the following population figures:—

Lions

Adults		Sub-adults		Cubs	Total
Male	Female	Male	Female		
52	68	13	14	58	205

Other species					
Panther	—	161	Four-horned antelope	—	1042
Striped hyaena	—	84	Chinkara	—	330
Cheetal	—	8431	Wild boar	—	2365
Sambar	—	760	Langur	—	6895
Bluebull	—	2036			

Thus, there was a net increase of 25 in the lion population during the 5 years period from 1974 to 1979 and a very substantial increase in the population of the wild ungulates which constitute their natural prey. This was no doubt attributable to the spectacular recovery which the degraded Gir forest habitat had made as a result of the protective and ameliorative measures adopted by the Gujarat Forest Department under its prestigious Gir Lion Sanctuary Project launched in 1972 at a cost of over Rs. 45 lakhs. In fact it was this bold and timely project which helped to reverse the downward trend and to save the Gir lion from total extinction. The salient features of this project have been dealt with in the following pages.

(I) Conservation Measures to save the Gir Lion

(i) Constitution the Gir forest as a Sanctuary-cum-National Park:—

51. Initially, an area of 1565.01 km² was notified as a Sanctuary by the State Government in 1965 under the provisions of the Gujarat Wild Animals and Wild Birds Protection Act, 1963, which was then in force. Subsequently, this legislation was superseded by the Wildlife (Protection) Act, 1972, which came into force in the State on 1.2.1973. Under the provisions of this new Act, an area of 147.12 km² of Amreli District was added to the Sanctuary in 1974, thus increasing its area to 1412.12 km². In 1975 the central core area of the Sanctuary comprised of 140.40 km² of forest falling in Jamwala and Chhodavdi Ranges was constituted into a Sanctum Sanctorum (National Park) with a view to providing immediate total protection from all forms of disturbance from man and cattle. All the resident maldharis (professional graziers) were shifted from this core area and resettled outside the Sanctuary limits. All commercial exploitation of the forest was also completely suspended, resulting in a sacrifice of an annual revenue of about Rs. 25 lakhs. Thereafter, in 1978, an additional area of 118.13 km² was notified as a National Park, thereby increasing the total area of the Sanctum Sanctorum to 258.71 km². During the current year (1982), on the recommendation of the State Forestry Conference held at Gandhinagar in November, 1981, the State Government have ultimately decided to upgrade the entire Gir Sanctuary to the status of a National Park. This enlightened measure constitutes an important landmark in the history of wildlife conservation in Gujarat and assures a secure and promising future for the Gir lion. The forest working plan for the Gir has also been overhauled and recast to make it completely wildlife-oriented to the total exclusion of any commercial or revenue considerations.

(ii) The Gir Lion Sanctuary Project:

52. By the year 1970, the Gir forest habitat, which represented the last refuge of the Asiatic lion, had, under the relentless pressure of man and cattle, reached an alarming state of degradation which put the very survival of the lion in serious jeopardy. The Gir forest habitat steadily dwindled as more and more forest areas were released for cultivation to satisfy the acute hunger for land. The large herds of cattle belonging to the resident maldharis and to the villages surrounding the Gir Sanctuary overran the forest areas like a swarm of locusts, stripping it bare of all vegetation and depleting the existing fodder and drinking water supplies to the detriment of wildlife. This retrogression ultimately recoiled on the maldharis themselves since their cattle had to go farther and farther from their nesses to find fodder, thus falling an easy prey to the lions which were compelled by force of prevailing circumstances to subsist almost entirely on domestic live-stock due to the diminishing population of wild ungulates which constituted their natural prey. Side by side, the economic condition of the maldharis also steadily deteriorated as they fell into the clutches of the local rapacious mohey-lenders who mercilessly exploited them in the barter of dairy products for cattle feed and foodgrains.

53. Recognising the great danger to the lion and the pitiable condition of the maldhari, immediately after the promulgation of President's rule in Gujarat in the year 1971, the then Governor, Shri Shriman Narayan turned his attention to these two problems viz.,

(1) the establishment of a stable eco-system under which the lion and other animals could move freely, assured of an adequate supply of their natural prey and food, and protected from poaching, poisoning and the spread of infectious diseases, and,

(2) the bringing about of the socio-economic uplift of the Gir maldharis.

54. Consultations were made for solving the above problem with a number of wildlife and ecological experts from all over the world. Eminent social workers and representatives of maldharis were also consulted. After considering their views, formal orders were issued by the Government of Gujarat to the effect that:

(1) The sanctuary should be permanently closed to grazing by domestic livestock from outside (migrating cattle);

(2) The area should be provided with a physical barrier to make the closure effective; and,

(3) Maldharis staying inside the Gir should be shifted together with their cattle in a phased programme and settled outside the Sanctuary by allotting them land for cultivation as well as common grazing ground for their cattle.

55. A Five Year Plan Scheme was prepared keeping in mind all the above objects and, in the year 1972, the same was sanctioned by the Government of Gujarat at a total cost of Rs. 45.07 lakhs. The salient features of the scheme were as under:—

(1) Fencing along the periphery of the Sanctuary by construction of a dry rubble wall of 1 metre height and raising of livehedge on both sides of the rubble wall to prevent any illegal entry of outside cattle into the sanctuary;

(2) Construction of barricades along the water courses traversing the periphery of the Sanctuary to prevent entry of cattle through the same;

(3) Providing check posts with barriers across all the public roads passing through the sanctuary so that entry and exit could be properly checked;

(4) Shifting of all permanent maldhari families from the sanctuary and their resettlement outside the sanctuary by allotting them cultivable lands and providing grazing land for their cattle.

56. The peripheral rubble wall together with the barricades along the water courses and livehedge on both sides of the rubble wall have been completed all along the periphery of the main block of the sanctuary over a total length of nearly 400 km and thus the sanctuary area has been completely sealed off from entry of outside cattle. Small blocks of sanctuary area adjoining the main blocks have also been given the same treatment of having a peripheral wall with barricades and thus the prevention of illegal entry of cattle and human beings into the sanctuary area has been ensured. The construction of checking "nakas" at all the main entry and exit points on the public roads has also been taken on hand and will be completed very shortly.

57. In consonance with the guidelines laid down on the recommendation of the Executive Committee of the Indian Board for Wildlife, the Working Plan of the Gir Forest has been revised and completely recast. It is the first working plan in the country which provides for the management of the forest area not for timber and forest products, but for conserving and improving the habitat conditions for wildlife. Two major Working Circles viz. Habitat Working Circle and Watershed Working Circle have been constituted, leaving the entire area of the National Park free from any commercial exploitation. The basic silvicultural system involves only the removal of dead, dying diseased and moribund trees. It also prescribes raising of artificial plantations in strips consisting of browse, shade and fruit species useful to wildlife and intensive soil and moisture conservation measures aimed at improving its habitat.

58. The Scheme for Resettlement of Gir Maldharis provides for granting of 32 hectares (8 acres) of cultivable land to each maldhari family and in addition a plot of

610 sq. metres as house site free of any charge. The cultivable land is thoroughly ploughed and made fit for sowing agricultural crops at Government cost and then allotted to each family. For construction of the residence, each family is being granted Rs. 2,500 as a subsidy and Rs. 2,500 as a loan. The household effects of maldhari families together with the material of dismantled huts are transported free of cost to the site of new settlement. In addition to the above, community facilities, such as drinking water, primary school, approach road, community centre, etc. are all provided by the Government. As a resident maldhari is primarily a cattle breeder, he does not possess agricultural implements and therefore the scheme provides for granting small agricultural implements to each family, so that it can start cultivating his field from the day he is shifted. Excluding the price of the cultivable land and house sites, the total cost for resettlement of one maldhari family comes to Rs. 6000/- exclusive of Rs. 2,500/- advanced as loan, which is being recovered in easy instalments.

59. Out of 845 maldhari families, about $\frac{2}{3}$ have been resettled outside in 14 different settlements so far and further work is in progress.

(iii) Problems of Protection:

60. Apart from the constant menace of cattle grazing, there has been a recent spate of organised thefts of teak timber, particularly from the Sanctuary areas adjoining Jamwala and Sapnes. The luxuriant ground vegetation resulting from effective protection of the forest habitat from grazing also poses a serious fire hazard during the hot and dry summer months. Damage from poaching is fortunately negligible, though recently a few stray cases of illicit shooting of deer by members of the notorious 'Dafer' tribe have been detected by the Sanctuary staff.

61. A modern wireless network costing about Rs. 32 lakhs which is currently being set up to cover the entire Gir forest should go a long way in improving the protection and management of the Gir National Park. It has also been decided to adequately arm the Sanctuary staff to bolster up their morale in tackling the timber smugglers and poachers.

(iv) Lion Safari Park Project:

62. The number of visitors coming to Gir for viewing lions and other wildlife during the 8 months period from November to June has been steadily increasing from year to year and is now well over 30,000 per annum. The main attraction for them so far has been the so-called daily 'lion shows' which enable them to view lions attracted to live baits from close quarters. This method is however not at all desirable as it not only causes too much disturbance to the lions but also adversely affects their normal pattern of behaviour and their natural skill at predation. It has therefore recently been decided to gradually discontinue the lion shows from the current fair season. As an alternative, it has been decided to set up

a natural looking Safari Park in a 400 hectare walled off enclosure being set up in the Devaliya Block of the Gir forest where visitors will be shown lions and their natural prey animals from vehicles without allowing a close approach on foot. This project which is expected to cost about Rs. 20 lakhs is currently under implementation and should be complete by the 1984 season at the latest.

63. Another visitor facility provided in Gir National Park recently is an elaborate Nature Orientation Centre set up in the tourist complex at Sasan with the object of educating visitors in the basic principles of ecology and thus enabling them to take intelligent interest in the entire eco-system instead of the mere thrill of viewing lions in the wild. Nature trails are also being laid out in the forest for supplementing the process of self-education.

(v) Establishing an alternative home for the Gir Lion:

64. As already stated earlier, the Gir forest represents the last stronghold of the Asiatic lion in the wild. Thus, in the event of a natural calamity such as an epidemic, the entire remnant population of this highly endangered species could be exposed to total extermination. The urgent need for establishing an alternative home for the Gir lion could therefore be hardly over-emphasized. The first in this direction was made in December, 1957, when a male lion and 2 lionesses captured from the Gir forest were released in the Chandraprabha Sanctuary near Varanashi in Uttar Pradesh. By 1964 their numbers were reported to have increased to eleven. However, their population declined rapidly thereafter and they soon disappeared, presumably for want of sufficient natural prey and effective protection against poaching. The existence of tigers in the same forest must have also contributed to their disappearance. Thus, this initial experiment of reintroduction of lions ended in failure due to improper site selection and inadequate protection.

65. The next attempt to find a second home for the Gir lion was made in 1978-79 when the Gujarat Forest Department launched an elaborate project at an estimated cost of over Rs. 60 lakhs to establish an alternative home for it in the Barda Hills near Porbandar about 200 km to the north-west of its present home in the Gir forest, where lions were known to have occurred during the last century. Accordingly, an area of 192.31 km² of the Barda forest was notified as a sanctuary in February, 1979. Since this forest area is at present in a highly degraded state and contains very little wildlife, the project provides for its protection and rehabilitation on the same lines as the Gir forest habitat, providing for the reintroduction of a couple of prides of Gir lions only at the final stage after the habitat has sufficiently improved and an adequate population of wild ungulates built up by way of natural food supply. A protective one metre high rubble wall all round the periphery of the sanctuary has already been completed and further work is in progress. This experiment, if it succeeds, will be a landmark in the history of wildlife conservation and management in this country.

(vi) Reintroduction of black bucks and grey hornbills in the Gir forest:

66. Attempts have also been made in recent years to reintroduce blackbucks into eastern Gir and grey hornbills in the interior portion of the National Park area. Both these species formerly occurred in the Gir forest but have now disappeared from the area. So far, about two dozen specimens of each of these species have been released and further work is in progress.

(vii) Crocodile Breeding in Gir:—

67. In view of the precarious position of the mugger or marsh crocodile (*Crocodylus palustris*) in Gujarat, the Forest Department has launched a successful programme of crocodile breeding at Sasan Gir from 1978-79. Every year 250-300 crocodile eggs are being collected during April-May from the Kamleshwar reservoir located within the Gir National Park and hatched out in an incubation room at the Sasan crocodile breeding centre and the hatchlings reared in a series of ponds provided for hatchlings of various age gradations. This scheme, which is sponsored by the Central Government, has yielded very encouraging results, with a high survival rate of 70 to 80%. Surplus hatchlings have also been supplied to the States of Maharashtra and Andhra Pradesh.

(J) Conclusion

68. It will be clear from the foregoing account that, thanks to the enlightened and progressive attitude of the Government of Gujarat and the timely action taken by its dedicated forest staff, the Gir lion and its forest habitat have been saved from annihilation and the future of this highly endangered feline has now become secure and full of promise. A great tragedy has thus been averted and our present generation can draw deep satisfaction and pride from the knowledge that the mighty roar of the lord of the Gir jungle shall continue to reverberate along hill and dale for the enjoyment of posterity, as if in response to the challenge of its African cousin from across the Arabian Sea.

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Management Problems of Wildlife in Tropics*

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Introduction:

Wildlife management is the branch of conservation that handles wildlife as the product of land. It is an ecological science which incorporates the relation of an organism to its environment, including other things that inhabit the same basic sources of soil, water, vegetation and atmosphere. The dynamic phase of wildlife management, thus deals with improvement of environment and as such involves several fields of human activity. The problems of wildlife management are, therefore, concerning ecological, economic, administration and public policy. The three objectives of wildlife management are (1) to maintain large, healthy, productive population of the native fauna as the habitat can support, (2) to reduce or alleviate damage to human interests by wild life, (3) to conserve genetic resources by avoiding extinction of wildlife population (Desmann, 1964; Bassus 1976).

There are five steps of wildlife management programme, namely (1) inventory, (2) census, (3) yield determination, (4) diagnosis and (5) control (King 1966). The inventory determines what species of animals are found on the area in question and their distribution over the area. The censusing is conducted in order to ascertain how much wildlife is present in the area. The yield determination measures the annual productivity. As applied to the environment, it is concerned with the quality, condition and availability, of the various cover types and the palatability, availability, dependability, yield, persistence and location with reference to cover types, and the palatability, availability, dependability, yield, persistence and location with reference to cover of the various food species. The diagnosis includes recognition of factors operating against various species, evaluation of the effects of these factors and choosing the limiting factors. The control measures are identified by the results of the diagnosis and consists for the most part of modifications of the environment.

A. Management Problems during Pinch Period:

The pinch period in tropics occur during summer when food, fire, water and cover act as limiting factors. No special efforts are made to evaluate the severity of the pinch period, neither there is any specific literature available relating to this problem. The present report

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is based on the author's field observation, discussions with the wildlife authorities and the work done during the Project Tiger Programme which was launched in 1972 to conserve the vanishing wildlife in India. The evaluation of pinch period in the Kanha National Park of India, which was done by Hasan in 1973 still serve a model for conservation of wildlife programme.

The severity of sun during summer is so acute that the water holes dry up and practically no food on the ground remains because of fires. Driven away by hunger and thirst bulk of animal population comes down to plains to feed on grass during day and night in shadows and to meet their water requirements in the water holes, scattered in these areas. Thus the activity of herbivores, carnivores and scavengers is concentrated near the area of water holes during pinch period in tropics.

(a) Limiting Factors:

(1) *Water*: Water is a limiting factor specially in hilly areas of forest which renders all life impossible during pinch period. In sandy river bed and streams the water remains clean till March. Thereafter it is covered by shedding of leaves and flowers. The decomposition of these leaves and flowers render the water blackish. The water holes in open meadows remain, however, clean. The animals like swamp deer, gaur, barking deer and other animals of hilly terrain are the worst sufferers of this limiting factor. The gaurs are observed coming out just after sun set and straightway go to the water holes in open meadows, so also does the swamp deer. The animals like four horned antelope, barking deer, spotted deer etc. which drink water at frequent intervals, are observed commonly at water holes during hot noon hours also. The availability of water in summer influences, therefore, the numerical strength of wildlife in the area and species composition. The tendency of game to congregate on certain water holes during pinch period is exploited by the poachers for their benefit. As a result the water becomes the most prevalent limiting factor in the reserves especially in dry areas. Koppikar (1979) discussed water as a limiting factor in tiger reserve.

(2) *Fire*: Fire is a very severe limiting factor in the tropics. It may occur naturally or as an accident. The occurrence of fire during March to June is common. The heavy shedding of sal leaves and flowers, dry grasses become highly susceptible to fire.

The fires in India are generally caused by local villagers who live near the forest and go in search of flowers of *Madhuca indica*, honey, leaves of *Diospyros melanoxylon* and shed antlers. The tribals believe the burning of forest as sacrifice to God whom they pray. To extinguish such fires especially in presence of continuous shedding of dry leaves and grasses is extremely difficult and impossible at times. By the end of May most of the forest areas get burnt. There is no food at ground level on hilly terrain and in valleys. The animals move to the adjoining meadows. The big animals are not destroyed, but the small mammals, insects and insectivorous birds are affected by sweeping fire.

(3) *Food availability*: The fire destroys the food of ungulates and, therefore, they are forced to come to open land meadows in search of food. Similarly grazing by cattle, which come in temporary camps in forests, further destroys the food for wildlife and thus causing a colossal habitat ravage which in turn results in drastic decline in the carrying capacity.

In summer there is scarcity of green fodder. The only green fodder available is *Moghania* shrub, sal seedlings and grasses along the bed of streams. The course feeders like gaur, blue bull go for dry grasses. Some nibble tender shoots at the base of grass clump, while others go for tender dry grass, shrub like *Moghania semialata* and seeds of *Cassia tora*. The axis deer, barasingha, blue bull etc. even feed on bark of trees.

The carnivores like tiger gets the food easily. Wild dogs frequently find swamp deer. The bears are fond of fruits, beetles, white ants etc.

Thus the scarcity of food during pinch period forces animals to adapt to different food habits. A close relationship between axis deer and langurs is such an example of association where the langurs drop tender branches, leaves and fruits on the ground and the deer feed on them. The herds of axis deer are frequently found moving with langurs from place to place.

(4) *Cover and shelter*: The cover and shelter are also important factors during pinch period. The escape cover for animals is depression in undulating terrain, glades of trees, water bodies, anicut etc. The ambush cover for carnivores is formed by curved roads, uneven terrain, streams in meadows, field level formation inside forests etc.

Shelter is of two types. The first type is the loafing ground of animals and the second type of physiological and psychological one. The loafing ground for different animals is as follows:

Species

Types of Shelter

Tiger	Bamboo thickets water ponds in stream bed. Thick tall grass.
Axis deer	Meadows or peripheral sal forest.
Swamp deer	Densely covered valleys and peripheral forests.
Barasingha (twelve horned deer)	Open meadows, and light canopy forest. High grasses in stream bed.
Black buck	Open meadows, solitary tree sheds.
Barking deer	Forested hilly slopes.
Blue bull	Open fields of forests
Gaur	Open meadows during night and thick valleys during day time.

(B) Management Methods:

(1) Water requirement

Following improvement works are needed to meet the water requirements of animals during summer.

(i) *Construction of polythene water holes:* The polythene water holes should be made on pilot basis near all the natural springs on hills to avoid wastage through unnecessary flow and seepage of water. This may be replaced by cemented water holes for the animals which frequently use them.

(ii) *Checking evaporation loss:* A thin film of edible oil should be sprayed on the water surface to check the loss through evaporation. This may help to retain water through out the year.

(iii) *Tapping of water:* If the water on higher elevation is available in sufficient quantity, it should be tapped to lower reaches through polythene pipes and other small water holes should be developed.

(iv) *Construction of anicuts and restoration of water tanks:* More anicuts in remote areas should be constructed. Similarly the old fashioned lakes should be deepened and properly bunded to hold water round the year. The water holes on hills should be inspected frequently to know the quality of water so that it could be improved. The water holes in river beds which get silted should be cleaned every year to sustain water during pinch period of summer and provide place for resting the large carnivores like tiger.

(2) Protection from Fire:

In order to control fire in forest, the most efficient way is to beat up the fire effectively. A dense net work of fire lines should be laid and be kept clean during fire season. All the fire lines, road and footpath acting as fire line should be burnt as soon as leaf falling is over. The temporary fire lines by cleaning of ground level should be prepared in important areas. A detailed fire scheme making all provisions should be prepared every year by the end of January and be implemented by the middle of February. The fire protection will prevent destruction of food, cover, microbiota and eggs of ground birds.

(3) Provision of Food:

The following improvement works are needed to solve food problems during summer:

(i) *Tree feeds:* The hay (dried tender grass) mixed with edible flowers, molasses and salt should be stocked in a shape of inverted cones. Such tree feeds should be made near all water holes on hills and meadows. The light and controlled lopping should be done

around water holes in remote areas on hills. The lopped material should be placed on game trails approaching water holes. The loppable species and palatability level should be determined first. The perennial and more palatable grasses should be replaced slowly in areas having less palatable and non-palatable grasses. The patch palantation of legumes should be taken up to supplement more palatable and nutritious food in extensive meadows. Similarly patch plantation of loppable fodder species should be taken up in meadows to provide shelter and food to animals.

(ii) *Grass feed*: To increase the use of less palatable grassy areas, mixture of urea, moaslses and salt (10-15 kg of moaslse + 2 kg of urea + 2% salt) should be sprayed on grasses.

(iii) *Salt licks*: The salt licks should be prepared in places having unutilized food so that more animals are attracted in the areas.

(4) **Cover:**

Cover conditions for animals especially ground birds and small animals are necessary. For this purpose the brush wood and thorns should be staked in heaps at different places in the meadows. If brush wood is not available, the heaps of barbed wires should be placed. A 2 m round strips should be cleaned around such heaps to protect them from fire. Initially grit mixed with grass seeds should be placed around such heap to attract birds.

B. Habitat Damage and Management Problems of Asian Elephant in Peninsular India

The total population of Asian elephants is estimated to be between 12,000 and 14,000 and nearly half of which range over the forests of Peninsular India (Nair and Gadgil, 1980). The major vegetation types in these areas range from tropical evergreen semi evergreen moist deciduous, dry deciduous to scrub and thorn forests. However, the deciduous forests are the optimal habitats for elephants. These habitats are being damaged by man and thus the elephants population now poses severe threat of decline. The damage done to the elephants habitat is due to (a) cultivation, both legal and illegal encroachment, (b) change of composition of forests by the silvicultural practices of Government Departments, and (c) man made constructions.

Habitat Damage

(a) *Cultivation*: In 1850s the coffee and tea plantations introduced in the Western Ghats began to take over vast stretches of the elephant habitat. Food and water became scarce due to floristic degradation and denudation. Elephants keep on moving from one place to another in search of food. They migrate along well established and well worn

trek routes and these routes are used by successive herds and even successive generations. Most of these well established trek routes are now getting blocked.

(b) *Silvicultural Practices*: Around 1860s the British introduced monoculture plantations of forests species in South India. Teak was the species favoured earlier as a prime timber species. The plantation of this naturally occurring species have not displaced to any great extent the elephants, which in fact, feed on the bark of teak trees. However, the plantation of another exotic species, i.e., *Eucalyptus* has a depressive influence. It has cut off the northern Benne forests of Mudumalai from the Nilambur forests in the South.

(c) *Man-made Constructions*: The construction of large reservoirs for the purpose of hydroelectric power and irrigation of agricultural fields all over the Western Ghats provided the opportunity for large scale exploitation of timber which degraded and fragmented the elephants habitat. There were no safeguards devised against this environmental damage. The examples of main projects, which caused damage to elephants habitat are: (1) Kali Hydel Project, (2) Tunga and Bhadra Project, (3) Kabhani Irrigation Project and (4) Annamalai Hydel project.

A series of reservoirs are under construction on the Kali river and its tributaries and they are located in the heart of Dandeli wildlife sanctuary. These have resulted in large scale deforestation because of submersion of forest in water as well as resettlement of affected villages and necessities of the large labour force. The elephants inhabiting these areas were distributed and began moving more extensively coming into contact with the cultivated areas of adjacent villages.

The clearing of forests in the submersion of the Tunga and Bhadra irrigation projects fragmented the hitherto continuous forest into many small isolated pockets. The final result is that the elephants habitat has been reduced to small areas of forests and thus their carrying capacity is also affected and these small pockets of forests may not be able to support them on long term basis.

Effect of Environmental Damage

The damage done to the elephants habitat due to silviculture practice and man-made constructions had resulted into: (1) man slaughter by elephants, (2) crop raiding by elephants, (3) risk to elephant life due to possibility of shooting, snaring, or poisoning extensive fire during dry season, (4) reduction in carrying capacity etc.

(1) *Man slaughter by elephants*: Since the human habitations have encroached into the homes of elephants, the elephants are aggressive towards them and are responsible for the killing of 8 to 10 people every year in South India. The encounter between man

and elephants is during late evening or at night. The manner of encounter varies widely. Mostly it happens when the people are working inside the forests or walking along paths and roads.

(2) *Crop raiding by elephants*: The pattern of cultivation in most of the elephant habitat follows the hill tops covered with forest. This imposes restrictions on the movement of elephants. Fragmentation of habitat and trapping of elephants in small forested pockets with cultivation all around is another factor responsible for crop raiding. These problems are acute in the highly fragmented elephant habitats of North Kanara and in the Eastern Ghats with its numerous enclaves or cultivation within the forests.

(3) *Risk to elephant life*: Ironically the elephants are blamed for causing damage to agricultural crops and hence they are shot, snared or poisoned by the cultivators. The extensive fire during the dry season is further inimical to the life of elephants. The villagers also let loose large herds of diseased cattle which spread disease and thus poses indirect threat to elephant population.

The elephant ivory has been a traditional raw material in the handicrafts in India. The poachers shoot elephants for this priced ivory. The most notorious centre of ivory poaching is the Periyar Plateau.

(4) *Carrying capacity*: The fragmentation of forests into small pockets, blockade of traditional route of elephants by man made construction, exploitation of habitat for cultivation by human settlement are responsible for inability to support elephant population on long term basis.

Management measures to conserve elephants

(1) *Legal measures*: In order to stop poaching it is imperative to issue more effective legal regulation which are to be enforced more strongly than in the past by according severe sanctions. Provision must be made for grant of compensation by a quick and expeditious process when there is loss of human life and damage to crops. Effective and expeditious steps should be taken to acquire the vast private forests.

(2) *Habitat improvement*: To increase the carrying capacity, certain measures of habitat improvement can be adopted. These include increase in food supply, improvement of water supply and creation of additional cover.

The food supply can be increased by controlled rotational burning of the ground vegetation as a result of which fresh grass will always be available and the vegetation cycle be maintained. Steps should be taken to restrict overgrazing inside the sanctuary and should be done on a phased programme.

During summer, only a very few water holes have water. Due to repeated visits by animals, these water holes get polluted. As this transmits diseases, fresh water holes have to be formed throughout the sanctuary area in a well distributed manner. Additional cover can be created by providing undisturbed passage to the elephants on their well established trek-routes: Corridors will have to be provided to them on the routes.

C. Water fowl management problems

The water fowl generally mean the aquatic birds of wild species belonging to the family Anatidae. They share certain common characters such as three toes linked by webs, flat spatulate bills, long necks, short legs and tails. All lay unspotted eggs in nests. Most of the ducks are flightless for almost a month after the breeding season. There are 147 species and include geese, teals, pintail, gadwal: wigeon spot bill, sheldrick, poachards, scaup, smew, mergansers, stiff tails, sheveller, tree duck, nukta, swans, scoters, golden eyes etc. According to the feeding habits, they are grouped into (1) dabblers which are surface feeding ducks e.g., mallard, pintail, teals, shovellers, wigeon etc., (2) divers which feed under water e.g., redhead, canvas, back, golden eye, legser scamp scoters etc., and (3) mergansers which are specialised for the under pursuit of aquatic animals, e.g., mergansen, rubby duck, etc. They are migratory also.

I. The preservation of habitat is essential for survival of water fowl. Since their habitat is water, the management of wet lands is important. These wet lands are slowly deteriorated. The aquatic vegetation and animal life on which the fowl subsist are also destroyed because of industrial effluents. Silting is also the destroyer of water fowl habitat. Excessive turbidity is also responsible for total absence of duck food. Thus the water fowl manager must have his goal to have sufficient clean water in right place at right time.

II. Water fowl in all stages of life need many kinds of food, plants and insects. The plants most relished by ducks are pond weed (*Polyenum*), wildcelery (*Vallisneria*), ground almond (*Cyperus esculantus*), duck weed (*Azolla*, *Lemna* etc.), coontail (*Ceratophyllum demersum*), mustegrass (*Chara*), Nalos water lettuce (*Pistia*), water hyacinth (*Eichornia crassipes*), lotus (*Nelumbo*), water chestnut (*Trepa*) etc. The animals most favoured by ducks are molluses and insects.

For management of plants, the efforts to remedy local situations can be directed (1) towards the elimination of the retarding factors thus permitting optimum growth of desirable food plants, or when this is not possible, (2) towards the establishment of food plant that can withstand the prevailing unfavourable local conditions. These factors that retard or prevent the successful development of valuable water fowl food can be grouped under (a) physical (b) chemical (c) biological and (d) economic one.

III. *Grazing and mopping*: Good range management is not considered good water fowl management. Grazing and mopping marsh, meadow and upland vegetation can do much to improve and maintain water fowl habitat. Grazing and mopping if improperly applied can do much harm than good.

Excessive grazing particularly in drought years temporarily ruin duck habitats. Vegetation is clipped to water surface and sites are muddied. Shore lines and shallow water feeding areas become uninviting to water fowl. I may, therefore, suggest that cattle and ducks are incompatible.

With grazing completely cut off the shore lines grow up to dense tall vegetation which is little used by ducks. The duck marshes will benefit from some degree of use by livestock. Similarly ducks and wild grazers together on grasslands and in marshes are in apparent harmony suggesting thereby compatibility of ducks and grazing.

(D) **Management of wild cattle in tropics**

There are a dozen species of wild cattle that still exist in the world. Out of these eight or nine species live in Asia and virtually all of them are endangered or threatened to some degree. These wild cattle belong to the large order of Artiodactyla, or even-toed ungulates which include antelope, deer, hippopotamus giraffe, sheep, goats, pigs and all important domestic animals are originated from them. Right from prehistoric times they supplied man with his most important prey species, drink, clothing and transport. They represent an important 'gene bank'. The aurochs which originated in India hundreds of thousands of years ago were the ancestors of all domestic cattle. These aurochs are now totally extinct and their last member died in the year 1627.

The wild cattle species that are endangered are:

- 1] The gaur, *Bos gaurus*
- 2) The banteng *Bos banteng*
- 3) The kauprey, *Bos sauveli*
- 4] The wild yak, *Bos grunniens*
- 5) The wild Asiatic buffalo, *Bubalus bubalis*
- 6) The low land annoa, *Bubalus depressicornia*
- 7) The mountain annoa, *Bubalus quarlesi*
- 8) The tamaro, *Bubalus mindorensis*

(To be continued)

Motichur and Rajaji Sanctuaries (Dehra Dun and Saharanpur)

By

V.K. VERMA

Wildlife Warden, Dehra Dun Region

Since Motichur and Rajaji Sanctuaries share common boundary on one side and hence these two sanctuaries can be considered integral parts of a single eco-unit. The statutory and management status of these parts will thus be identical in order to ensure continuity and uniformity on a long term basis.

In order to ensure better wildlife management of the above eco-unit, the area should be divided into core, buffer and peripheral zones.

Extension of Motichur Sanctuary by taking over further area of Bahera, Jhabrawala, Amsot, Balindawala, Phandowala, Mohamadpur forest block will ensure uniformity and continuity of both sanctuaries for better management. Only constraint will be faced from villages lying close to the above areas.

Range of Wildlife

Main herbivores to be found are spotted deer, sambar, muntjac, blue bull, wild elephants, pigs, common langur and monkeys. Among the predators are the tiger and leopard or panther. The main scavenging mammals are jackal and hyena. Sloth bears although in less numbers is omnivorous. There are a few hundred bird species. Some of them pretty and others good songsters. Storks, teals, pintails, pond herons, egrets are water birds, whereas peafowl, jungle fowl, spur fowl, partridges and quails are common birds. Ring doves, spotted doves, parakeets, green pigeons and rock pigeons are also numerous. Cuckoos, papihas and other song birds are common. Rollers, bee eaters, hoopees, drongos, warblers, kingfishers, wood pecker, finches, orioles and fly catchers are represented by several species. Black Ibis and Crow pheasants are also often seen. Eagles, kites falcons are birds of prey and vultures are scavengers. Owls, owlets and night jars are birds of night.

Population Density

The densities vary considerably. Ascending levels of population can be identified in different areas corresponding to their conservation history. In some areas of sanctuary, the densities are optimum. Excellent potential can be increased by intensive programme of protection and habitat development.

Interspecific, Intra Specific and Predator—Prey relationship

Main predators in order of importance are the tiger, the panther and the main prey animals in order of importance being the cheetal, sambar, wild boar, blue bull, muntjac, the langur and monkey. There is an overlap in the preferences. No adverse impact on account of competition among these predators has been noticed.

Limiting Factors

The prominent limiting factor has been the disturbance from intensive forestry operations, ravage from grazing, scarcity of water during summer, colonisation of several potential excellent pockets of wild life habitat by human settlements, scarcity of food induced by summer fire and poaching which have effects on the population dynamics of wildlife. Basic minimum needs for the wildlife management are water, food and shelter and if any of them is in short supply, the population is bound to suffer.

Water and Food

Water table during summer drops considerably and streams start drying up. Some perennial water holes in the slopes of seepage springs occur on the hill slopes but wild animals can not use them because of Gujars camps. More water is available close to the villages at the periphery of the sanctuary. Animals become easy victim of the poachers there.

Although food is in plenty for both the carnivores and herbivores and the carrying capacity of the sanctuary appears to have a larger number of animals than what they are having now but due to water scarcity in most of the parts, the areas can not be harnessed. It is difficult for them to eat at one place and walk a number of kilometres to drink water and again come back to feed. The carnivores especially the tiger needs a large quantity of water. Specially during summer months it is known that after eating a little of the kill, the tiger moves for water but fails to return to the kill and when he is again hungry, he kills one more animal. This way, there is more loss to the prey population of the sanctuary. Water scarcity continues for 3-4 months in the year. Due to water scarcity the animals congregate in the larger numbers around water holes where they fall easy victim to poachers and predators.

Human Settlements

On account of need of labour for forestry operations, village settlements like taungya were encouraged in the past inside the forest blocks. Gujjar settlements came up around perennial water holes. Thus several pockets with high carrying capacity for wildlife came under human settlements which have been highly prejudicial to the wildlife.

Summer Fires

During summer, dry foliage and leaf litter constitutes a serious fire hazard. Although, these ground fires do not significantly harm the trees but they invariably burn up all the

fodder at the browsing level. Scarcity of fodder induced by summer fires, acting in conjunction with water scarcity introduce pinch period from May to mid of June.

Poaching

Because the vehicular entries are being checked closely, the poaching hazard from motor vehicles is less. But because of insufficient staff and the situation of the villages in the vicinity of its periphery, poaching has not been eliminated.

Management

After identifying above limiting factors, the basic object in formulating the course of management is to rejuvenate the habitat by combating these limiting factors and thus to maximise population of natural and complex of prey and predator within the perimeter of intrinsic carrying capacity. Compensatory development have also to be resorted to like creation of water holes, construction of anicuts ensuring development of a meadow through weed eradication (Weeds are the result of exasive grazing in the past).

Management plan will be prepared on the basis of above habitat factors, plant and animal communities, evaluation of potentialities of the habitat versus limiting factors. Intensive anti-poaching and fire protection will be emphasised more.

Zonation

Core Zone—The Core zone of the sanctuary will consist of part of Mohamadpur, Phandowala, Balindawala, Amsot, Jhabrawala, Bahera, Koelpura, Motichur, Danda and Jamunkhata forest blocks in East Dehra Dun Forest Division and part of Mohand, Chillawali Gaj, Andheri, Dholkhand, Malowali, Bam, Betwan, Gnoina, Harnaul, Chirrak and Ravli Forest blocks in Rajaji Sanctuary above 100' fire line except Dholkhand and Malowali blocks where the boundary extends downwards from 100' Fire line. The ridge is common boundary of both the sanctuaries. The northern boundary of the core will end at Mohamadpur 1a and 1b and Southern boundary ceases at Rauli Danda 3, Jamunkhata 3.

Thus core zone of approximately 176.25 square kilometres has been identified where diminutive human use of all sorts shall be excluded. The core area will be controlled and managed effectively only by wildlife preservation organisation.

The following things will be carried out within the core zone:

- (1) Prescription of stoppage of all forestry operations.
- (2) Shifting of gujjar camps and relocating them in peripheral area and Pathri forest block.

- (3) Stoppage of grazing by cattle of villagers and gujjars.
- (4) Reamuliration of regressive meadows.
- (5) Development of water facilities by providing water holes and anicuts.
- (6) Creation of artificial saltlicks at suitable places for uniform spreading of animals.
- (7) Planting of Am, Kusum, Har, Bahera, Mulberry, Bamboo, Bargad, Peepal etc. for food at the above places.

(8) Although all the forests are highly prone to summer fires, measures to prevent these fires should be taken. Early controlled burning of forest blocks and fire lines during mid spring could reduce the damage and allow some green fodder to come up before pinch period during summer.

Fire Protection

Summer fires are highly detrimental as they destroy all fodder in the affected area at a time when renewal before rain is not possible. Old fire line should be properly maintained and nearly 200 km. of new fire lines should be made. Difficult terrain and lack of roads and speedy transport delay the fire fighting.

At least 15 fixed and 8 man pack wireless sets should be provided with commanding observation towers and control rooms.

Forest Operations

No forestry operations will be allowed.

Wood Theft

Demand of wood by the people could be met from the peripheral and buffer zone

Grazing

Stopping of grazing by all outside cattle will be prescribed. All gujjar camps shall be shifted from the core zone to peripheral area and Pathri forest blocks.

Human Interference

Increase of wildlife staff for intensive management is necessary and hence in each range at least one Assistant Wild Life Warden and 4 Wild Life Guards shall be the minimum requirement. Thus total 3 Assistant Wild Life Wardens and 12 Wild Life Guards in Motichur Sanctuary and similarly 3 Assistant Wild Life Wardens and 12 Wild Life Guards in Rajaji Sanctuary will be required for protection, antipoaching and control of the movement of villagers for honey, fruits, fuel collection etc.

Anti-poaching

Possibility of poaching from vehicles will be completely eliminated by effective control over all the entries. For prevention of poaching by villagers coming on foot, maximum outstation patrol camps will be operated.

Disease

Precaution will be taken against the communication of cattle diseases to the wild ungulates.

Buffer Zone

The Buffer Zone of approximately 253.75 square kilometres around the core will be constituted as shown in the enclosed map. In the buffer area, forestry operations, silvicultural operations, plantations etc. could be adopted but they should be wildlife oriented operations.

Silvicultural System

Choice of silviculture system is vitally important as choice of tree species to be favoured at the cost of species important for wildlife clear felling system like coppice should be avoided. Fruit, fodder, trees should not be removed at any cost although they may have low timber value. Fair number of dead, dying trees should be retained as shelter for birds and small mammals. Grassy blanks should not be attempted to be covered by gap planting.

Plantation

Monoculture plantation should be avoided by mixing few other species along main species in extensive plantations, particularly of Teak, Eucalyptus etc. which hardly permit any under storey to develop. At least 25% area should be maintained with natural cover in the form of strips in between plantation blocks, grassy blanks and strips of natural forest along stream banks should not be planted up at all. Annual plantation not exceeding 150 hectares should be broken into well dispersed blocks so that 'edges' occur between planted area and natural forest and between different ages of plantations. This will help habitat diversity to be maintained. Under planting of bamboos should be done in some plantations. No agriculture crop should be permitted in the new interplantation spaces.

Forestry Operations

Well planned forestry operations could be advantageous to wildlife creating wide habitat diversity. Making new roads for extraction of forest produce, location of labour camps near important water holes and human movement through out the area, plying of trucks at night should be discouraged.

Collection of Minor Forest Produce

Some minor forest products are of significant importance for wildlife e.g. Pula, Bhabre, Bansi-grass, Seeds of Aonla, Asna, Bahera, Harar, Bargad, Ber, Jamun, Kusum, Papri, Rohni, Semel, Pula, Mahua etc. Such collections are becoming so intensive that it leads to total deprivation and creating food scarcity for wildlife. Trees are further damaged for collection of fruits, honey, gum etc.

Fire

All forests are highly prone to summer fires. Early control burning of forest blocks and fire lines during spring could reduce the damage and allow some fodders to come up before the pinch period.

Handling Regression in Vegetation

Regressions are the main features of replacement of grasses, fodder plants, tree generation by growth of annual weeds like *Cassia tora*, *Xanthium*, *Bambulus Khang*, *Lantana*, *Odoratum* etc. denudation of ground vegetation.

Annual weeds can be removed by uprooting or cutting during August when plants have flowered but seeds have not come. Such operations can give good results if grazing is stopped or controlled by rotation grazing. Removal of *lantana* and *eupetorium* can be done by biological methods.

Peripheral Zone

The peripheral area has been illustrated after the buffer zone in the enclosed map. The peripheral zone touches the out skirts of the village which could be constituted as Game Reserve. In the peripheral area, rights and concessions of villagers, grazing of cattles should be allowed. Specific areas will be defined, few gujjars could be persuaded to take a rotational grazing. Planting of lopping and fodder trees should be done for the cattle to keep healthy utilisation of habitat for production of milk and meat. If species like *eucalyptus* are planted, naturally they are safe from lopping but at the same time so much production of milk and meat is also lost. An eco-system approach for forestry practices should be done and thus object should be to have the maximisation of net harvestable biomass instead of maximum M.A.I. of the timber alone, value of scrub and grasslands should be assessed in terms of their total productivity and not in terms of timber production. Efforts will be thus made to improve pastures in the forests and soil conservation and social forestry programmes. These programmes will benefit the wildlife indirectly.

The real achievements could be obtained by above management approaches in the development of environment of the sanctuary for recovery of vegetation improvement in water holes, availability of perennial water, sufficient fodder productivity, effective grazing control, stoppage of forestry operations, anti-poaching efforts. The status of the prey and predators will thus improve.

Animal Census

Census of animals in different forest blocks of the sanctuary has been carried out from 7-6-82 to 21-6-82 by recording casual observations and by pug mark evidences by the wildlife and territorial staff. Systematic sampling of monitoring could be done on fixed routes provided the area is transferred to wildlife organisation. The annual census of herbivores and carnivores will not only demonstrate the population trend but also the movement of animals to different areas. By knowing population of wild animals translocation of animals could be done in these areas where herbivorous population is less. Details of the wildlife census carried from 7-6-82 to 21-6-82 are given in the next page.

Wild Life Census carried from 7-6-82 to 21-6-82

Forest Block	Tiger	Leo- pard	Samber	Cheetal	Barking deer	Ghoral	Neelgai	Pig	Ele- phants
<i>Proposed Motichur Sanctuary</i>									
Mohammad- pur	2	—	14	68	20	—	—	64	—
Phandowala	—	—	8	35	8	—	—	60	—
Balindawala	1	1	10	35	15	—	—	55	—
Amsot	—	—	6	31	15	—	—	62	—
Jhabrawala	1	—	15	72	18	—	—	53	—
Bahera	2	—	13	82	8	—	—	88	10
Koelpura	2	—	14	123	9	—	—	61	—
Motichur	—	—	8	51	15	—	—	55	13
Danda	—	—	8	51	3	—	—	53	13
Jamunkhata	—	1	13	33	1	—	—	25	—
Total	8	2	105	513	92	—	—	512	36
<i>Rajaji Sanctuary</i>									
Mohand	—	1	—	100	33	16	—	75	—
Sukh	—	1	26	84	21	8	13	30	—
Chillawali	1	1	27	107	21	22	4	45	—
Gaj	—	1	18	74	14	—	12	19	3
Andheri	1	2	31	84	32	8	—	120	9
Dholkhand	2	1	24	182	5	—	—	120	2
Malowali Bam	—	—	6	78	8	—	7	140	3
Betwan	—	1	12	75	22	—	11	140	—
Gholna	—	—	10	84	17	—	16	100	—
Harnol	—	—	9	101	17	—	19	180	—
Chirak	—	—	7	70	17	—	15	118	—
Rauli	—	—	11	25	17	—	12	80	—
Ranipur	—	—	14	109	22	—	—	90	—
Total	4	8	195	1153	246	54	109	1257	17
G. Total	12	10	300	1666	338	54	109	1762	53

(Continued from Page 4)

decade. I have heard it widely said that CITES has now come of age. I have no doubt, therefore, that mature and responsible solutions will be found with the genuine co-operation of all concerned. I am particularly happy that keeping with the importance of the meeting, the Executive Director of UNEP Dr. Mostafa Tolba is with us today to lend support to finding a practical way ahead in this matter.

10. Perhaps the most important task of the Standing Committee has been to prepare for this meeting. On this occasion I would like to express our deep appreciation and gratitude to the Government of Botswana not only for agreeing to host the Conference but also for establishing the Organization Committee. This, along with the Secretariat, has worked assiduously and with remarkable devotion and competence to making all the preparations and arrangements required for the meeting. On behalf of all of us here, may I take the liberty of thanking our host country for the warm hospitality we are being shown. Put together, all of this is so essential to the process of effective communication on such an occasion.
11. We have a heavy agenda before us for the next few days. Let us set ourselves to the tasks ahead of us full of hope, confidence and determination—hope and confidence in the ability of all of us to fulfil the grave mutual responsibilities that we have assumed, the determination to live up to the expectations of those whom we represent to uphold and implement the principles and objectives of the Convention.

— — —

I had the pleasant experience of being with Dr. Salim Ali when he stayed at Magra Forest Rest House, twenty kilometres from Mussoorie on Mussoorie-Chamba Road from 15th to 19th June 1983. Dr. Salim Ali was on a short rest-cum-bird-watching trip. During his stay Dr. Salim Ali observed the following birds:—

1. Jungle crow
2. Common myna
3. Jungle myna
4. Spotted dove
5. Rufous turtle dove
6. Wedge-tailed green pigeon (Kokla)
7. Grey-headed flycatcher
8. Verditer flycatcher
9. Indian tree-pie
10. Red-billed blue magpie
11. Black-throated jay
12. Grey tit
13. Black tit
14. Green backed tit
15. Yellow-cheeked tit
16. Red-headed tit
17. White-throated laughing-thrush
18. Streaked laughing thrush

19. Blue-headed rock-thrush
23. Himalayan green finch
21. Himalayan nutcracker
22. Himalayan whistling-thrush
23. Cuckoo
24. Scaly-bellied Woodpecker
25. Minivet
26. Black-headed shrike
27. White eye
28. Lineated barbet
29. (Red-rumped) swallow
30. Cinnamon tree sparrow
31. White-backed vulture

The following four birds were heard but not seen:—

1. Scimitar babbler
2. Black partridge
3. Oriole
4. Himalayan Cuckoo

V.K. Verma
Wildlife Warden
Dehra Dun Region

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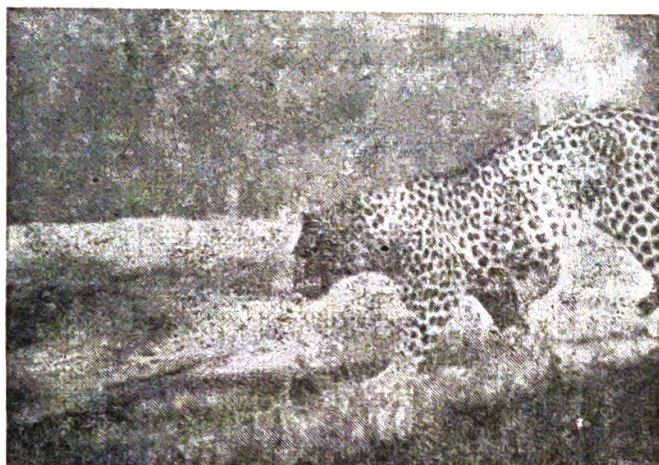
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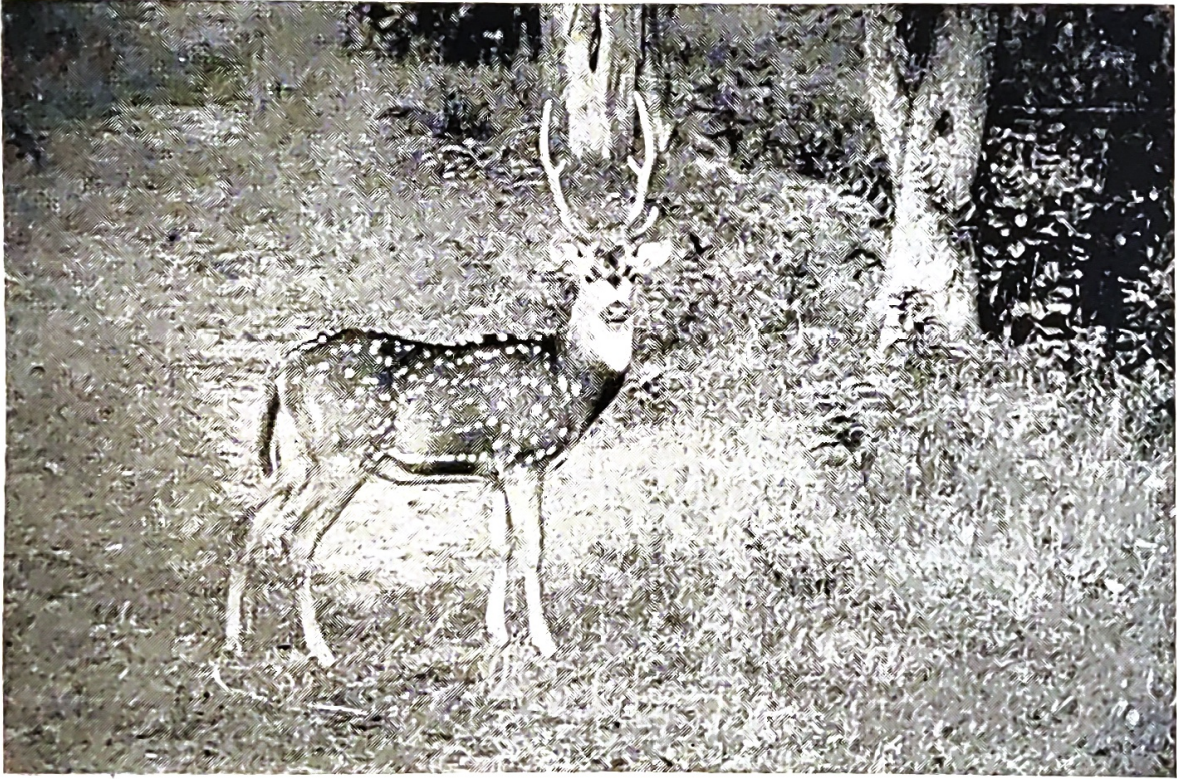
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1. The aims and objects of the Society are :—

- (a) To promote interest in and impart knowledge regarding the preservation and conservation of all forms of wildlife, particularly among the youth of the country.
- (b) To co-operate with the Govts. of India and States and with other Societies and Institutions having similar aims and objects in working for the interests of wildlife.
- (c) To assist in enforcing and actively supporting the Forest Acts, Wild Birds and Animals Protection Acts and Rules etc. of States and the Indian Arms Act and Rules in so far as they pertain to wildlife and to bring to the notice of the authorities any infringement of the same and to assist in the detection and prosecution of offenders in respect of such laws.
- (d) To advise and help the Govt. and wildlife administrators in the formation, maintenance and protection of Sanctuaries and National Parks, the preservation of wildlife in general and rare species of India in particular and in the introduction of exotic species into the country, the rehabilitation of rare species etc. and in the revision on rational lines of the shooting and fishing rules, so as to conserve and increase wildlife stocks.
- (e) To raise funds for the carrying out of the above aims and objects and to found and maintain museums, reading rooms and libraries of natural history in order to disseminate knowledge regarding wildlife.
- (f) To promote sportsmanship in shikar and to recognise well regulated shooting and fishing, as a means of preserving wildlife and fish so that through wise use the surplus may provide a recreational asset to the nation.
- (g) To carry out publicity and propaganda for the preservation of wildlife in India by means of monographs, journals, films, film strips and other feasible methods.
- (h) To assist members of the Society in obtaining shooting and fishing facilities and facilities for viewing and photographing wildlife in India.
- (i) To conduct research into the problem of Wildlife management in India, and in pursuance of this, to initiate, encourage and, where possible assist in projects for the study of threatened species and related subjects and to provide reference and research facilities for such work.
- (j) To carry on such other activities which will serve the above subjects.

What membership of Wildlife Preservation Society of India will entitle you to ?

1. You will become an active member of the growing group of Wildlife enthusiasts, who enjoy working for and spreading the knowledge of how to conserve India's heritage of Wildlife for posterity.
2. You will be entitled to the full use of the library of the Wildlife Preservation Society and of its reading room.
3. You will receive a membership certificate.
4. You will receive personal Identification and Membership card.
5. You will be entitled to buy all publications of the Society at a concessional rate.
6. You will be entitled to buy at concessional rates the Society's Tie, and the Balance of Nature Game (specially published in colour for its educative and recreational value).
7. You will be supplied "Cheetal", journal of the Society free.

For membership particulars write to Honorary Secretary, Wildlife Preservation Society of India, 7 Astley Hall,

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